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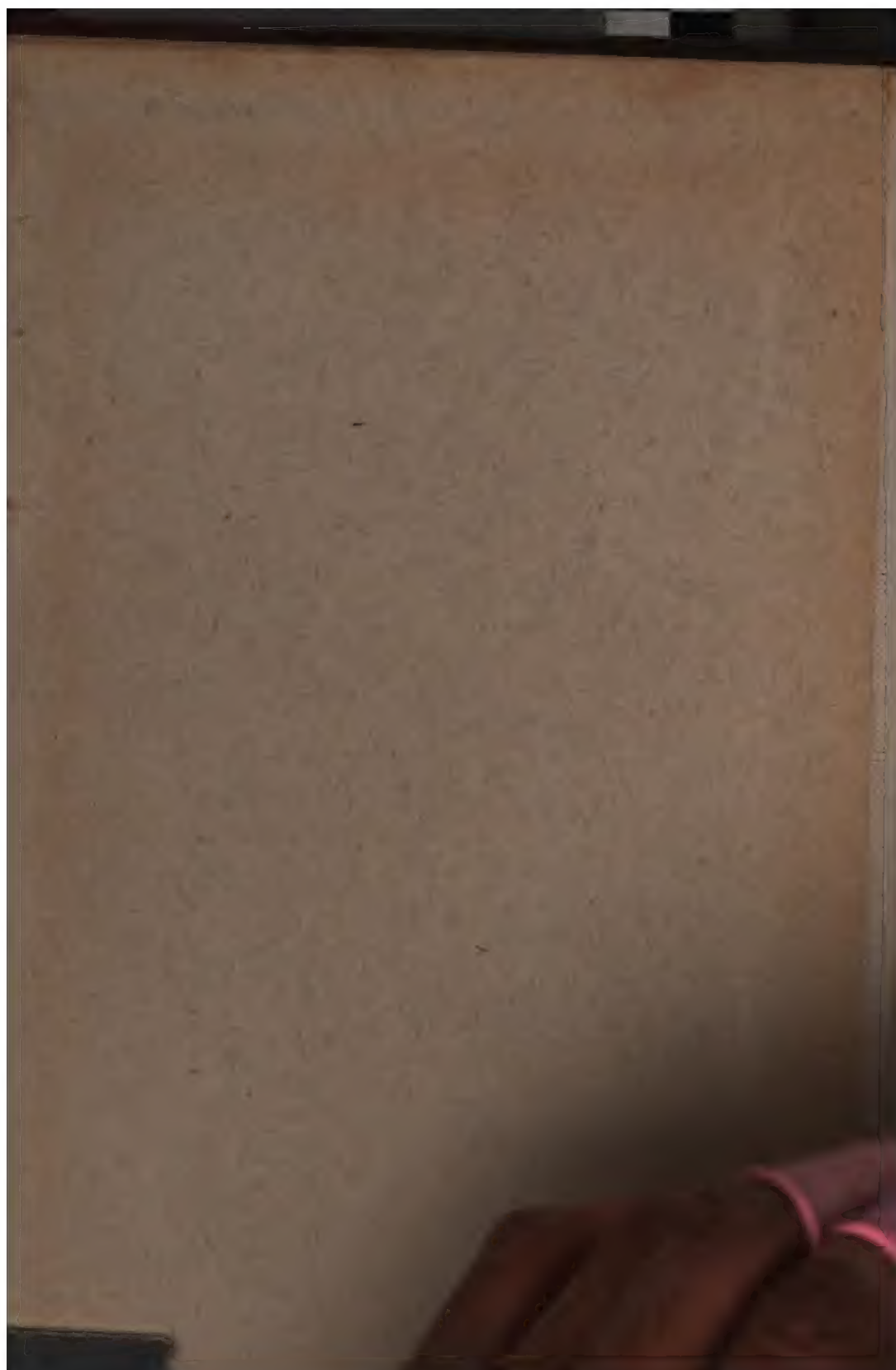
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VOLUME TWO

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A DICTIONARY OF  
**ELECTRICAL**  
WORDS, TERMS *and* PHRASES

BY

EDWIN J. HOUSTON, A.M., PH.D.

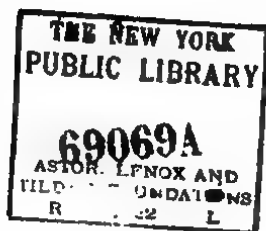
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EXHIBITION, ETC., ETC., ETC.

PART TWO—T to Z



NEW YORK  
P. F. COLLIER & SON

1903



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# A DICTIONARY OF ELECTRICAL WORDS

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## VOLUME TWO

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### T

**T.**—A symbol used for time.

**T-shaped Spark.**—(See *Spark, T-Shaped.*)

**Table, Quadruplex, A-Side of** — —  
That side of a quadruplex system which is worked by means of reverse currents. (See *Telegraphy, Quadruplex.*)

**Table, Quadruplex, B-Side of** — —  
That side of a quadruplex system which is worked by means of strengthened currents. (See *Telegraphy, Quadruplex.*)

**Tables of Conducting Powers.**—(See *Powers, Conducting, for Electricity. Resistance, Electric.*)

**Tachograph.**—An apparatus for recording the number of revolutions per minute of a shaft or machine.

**Tachometer.**—An apparatus for indicating at any moment on a revolving dial the exact number of revolutions per minute of a shaft or machine.

A tachometer is sometimes called a speed indicator.

**Tachyphore.**—A term proposed by Wurtz for a system of electric transportation, in which a carriage, formed of magnetic material, is propelled by the sucking action of solenoids placed along the track and energized in succession during the passage of the car.

This is generally called the portelectric system. (See *Portelectric.*)

**Tail Light.**—(See *Light, Tail.*)

**Tailings.**—False markings received in systems of automatic telegraphy, due to retardation. (See *Retardation*.)

**Tailings.**—A term applied to the current that runs out of a line at the receiving end.

The current that continues to run out at the receiving end of the circuit after the sending current is broken.

The tailings in a telegraphic line are due to the effects of self-induction and static capacity following the breaking of the circuit which produce a current in the same direction as that sent into the line. Consequently, on the breaking of the circuit, the current continues to flow out of the line at the distant or receiving end. This prolongation of the original current is known technically as the tailing or the tailing current.

**Talk, Cross** — —In telephony an indistinctness in the speech transmitted over any circuit, due to this circuit receiving, either by accidental contacts or by induction, the speech transmitted over neighboring circuits.

**Tangent.**—One of the trigonometrical functions. (See *Function, Trigonometrical*.)

**Tangent and Sine Galvanometer, Combined** — —(See *Galvanometer, Combined Tangent and Sine*.)

**Tangent Galvanometer.**—(See *Galvanometer, Tangent*.)

**Tangent Scale.**—(See *Scale, Tangent*.)

**Tangentially Laminated Armature Core.**—(See *Core, Armature, Tangentially Laminated*.)

**Tank, Cable** — —A water-tight tank in which a section of a cable is placed for purposes of testing.

The cable is tested either when merely covered by water, or when subjected to a pressure approximately equal to or in excess of that to which it will be subjected when laid in the water.

Reid has constructed cable tanks for testing under pressures as great as 4,500 pounds per square inch. The pressure is obtained by means of force pumps.

When a cable section is subjected to these pressures any flaws or defects would be at once detected by the entrance of the water.

**Tanning, Electric** — —An application of electric currents to tanning leather.

The dressed hides are steeped in a solution of tannin through which an electric current is passed.

It is claimed, that by this process, the hides are thoroughly tanned in from one to four days, in place of from four to twelve months, as required by the ordinary process.

The tanning solution is placed in a vat furnished with suitable electrodes and filled with the tanning liquid, and the articles to be tanned are placed between the electrodes and a motion of revolution given to the vat. By these means the time required for the completion of the process is considerably shorter than that required by the ordinary process.

**Tap.**—A conductor attached to a larger conductor in a shunted circuit.

**Tap, Ampère** — —A tap provided for carrying off a current of one ampère.

**Tap Wires.**—(See *Wires, Tap*.)

**Tape, Insulating** — —A ribbon of flexible material impregnated with kerite, okonite, rubber or other suitable insulating material, employed for insulating wires or electric conductors at joints, or other exposed places.

Sometimes the tape is formed entirely of some or another of the above named insulating materials.

**Taped Wire.**—(See *Wire, Taped*.)

**Tapper, Double-Key** — —(See *Key, Double Tapper*.)

**Target, Electric** — —A target in which the point struck by the ball is automatically registered by means of electric devices.

A variety of targets have been devised. Generally, however, the target is divided into a number of separate sections provided with circuits of wires, on the making or breaking of any of which, by the impact of the ball, the section struck is automatically indicated on an electric annunciator. (See *Annunciator, Electro-Magnetic*.)

**Taste, Galvanic** — —A sensation of taste produced when a voltaic current is passed through the tongue or in the neighborhood of the gustatory nerves, or nerves of taste.

**Teaser.**—An electric current teaser. (See *Teaser, Electric Current.*)

**Teaser, Electric Current** — —A coil of fine wire placed on the field magnets of a dynamo-electric machine, underneath the series coil wound thereon, and connected as a shunt across the main circuit.

The name *teaser* was applied by Brush to the coil of fine wire used as above described to maintain constant electromotive force under variations of load.

**Technics, Electro** — —The science which treats of the physical applications of electricity and the general principles applying thereto.

**Tee, Lead** — —A tee-shaped lead tube provided for the purpose of taking a branch joint from a main cable to a service line.

**Tee, Split-Lead** — —A tee-shaped lead tube that is split for readily covering a joint at a loop in a cable.

**Tel-Autogram.**—The recorded message obtained by means of a tel-autograph. (See *Tel-Autograph.*)

**Tel-Autograph.**—A telegraphic system for the fac-simile reproduction of handwriting.

**Teleautograph.**—An orthography sometimes employed for tel-autograph. (See *Tel-Autograph.*)

**Tele-Barometer, Electric** — —An electric recording barometer for indicating and recording barometric or other pressures at a distance.

**Telegrapher's Cramp.** (See *Cramp, Telegrapher's.*)

**Telegraphic.**—Pertaining to telegraphy.

**Telegraphic Alarm.**—(See *Alarm, Telegraphic.*)

**Telegraphic Alphabet.**—(See *Alphabet, Telegraphic.*)

**Telegraphic Alphabet, Continental Code** — —(See *Alphabet, Telegraphic; International Code.*)

**Telegraphic Alphabet, Morse's** — —(See *Alphabet, Telegraphic; Morse's.*)

**Telegraphic Arm.**—(See *Arm, Telegraphic.*)

**Telegraphic Bracket.**—(See *Bracket, Telegraphic.*)

**Telegraphic Cable.**—(See *Cable, Telegraphic.*)

**Telegraphic Code.**—(See *Code, Telegraphic.*)

**Telegraphic Earth-Circuit.**—(See *Circuit, Earth, Telegraphic.*)

**Telegraphic Embosser.**—(See *Embosser, Telegraphic.*)

**Telegraphic Fixtures.**—(See *Fixtures, Telegraphic.*)

**Telegraphic Fixtures, House-Top** — —(See *Fixtures, Telegraphic House-Top.*)

**Telegraphic Ground Circuit.**—(See *Circuit, Ground, Telegraphic.*)

**Telegraphic Joints.**—(See *Joint, Telegraphic or Telephonic.*)

**Telegraphic Key.**—(See *Key, Telegraphic.*)

**Telegraphic Line Circuit.**—(See *Circuit, Line, Telegraphic.*)

**Telegraphic Needle.**—(See *Needle, Telegraphic.*)

**Telegraphic Paper Winder.** (See *Winders, Telegraphic Paper.*)

**Telegraphic Pocket Relay.**—(See *Relay, Pocket Telegraphic.*)

**Telegraphic Register.**—(See *Register, Telegraphic.*)

**Telegraphic Switch Board.** (See *Board, Switch, Telegraphic.*)

**Telegraphic Translator.**—(See *Translator, Telegraphic.*)

**Telegraphically.** — In a telegraphic manner.

**Telegraphing.** — Sending a communication by means of telegraphy.

**Telegraphy, Acoustic** — —A non-recording system of telegraphic communication, in which the dots and dashes of the Morse system, or the deflections of the needle in the needle system, are replaced by sounds



that follow one another at intervals, that represent the dots and dashes, or the deflections of the needle, and thereby the letters of the alphabet.

Morse invented a *souder*, for this purpose, which is used very generally. (See *Souder*, *Morse Telegraphic*.)

Steinheil and Bright each invented acoustic systems of telegraphy in which electro-magnetic bells are used.

For details of the apparatus and system see *Telegraphy*, *Morse System of*.

#### **Telegraphy, American System of** — —

A term sometimes applied to the Morse system of telegraphy. (See *Telegraphy*, *Morse System of*.)

**Telegraphy and Telephony, Simultaneous, Over a Single Wire** — — Any system for simultaneous transmission of telegraphic and telephonic messages over a single wire.

These systems are based, in general, on the fact that a gradual make-and-break in a telephone circuit fails to appreciably affect a telephone diaphragm. By the use of graduators the makes and breaks required for the transmission of the telegraphic dispatch are effected so gradually that they fail to appreciably influence the telephone diaphragm, and thus permit simultaneous telegraphic and telephonic transmission over a single wire. (See *Graduators*.)

**Telegraphy, Autograph** — — A name sometimes applied to fac-simile telegraphy. (See *Telegraphy*, *Fac-Simile*.)

**Telegraphy, Automatic** — — A system by means of which a telegraphic message is automatically transmitted by the motion of a previously perforated fillet of paper containing perforations of the shape and order required to form the message to be transmitted.

The paper passes between two terminals of the main line, the circuit of which is completed when the terminals come into contact at the perforated parts, and is broken when separated by the unperforated parts of the paper.

In the automatic telegraph some form of registering apparatus is employed.

In the Wheatstone system, the perforations mechanically control the movements of the levers which make contacts between the line and the battery.

The advantage of automatic telegraphy arises from the fact that the rate of transmission or reception of signals does not depend on the expertness of the operators, and the messages may be perforated on the slips preparatory to transmission.

Type printing telegraphs are often used for registering apparatus, in which case the impulses required for the transmission of the different letters are automatically sent into the line by the depression of corresponding keys on a suitably arranged key-board.

**Telegraphy, Chemical** — — A system by means of which the closings of the main-line-circuit, corresponding to the dots and dashes of the Morse alphabet, are recorded on a fillet of paper by the electrolytic action of the current on a chemical substance with which the paper fillet is impregnated. (See *Recorder*, *Chemical*, *Bain's*.)

**Telegraphy, Contraplex** — — Duplex telegraphy in which transmissions are simultaneously made from opposite ends of the line.

When the transmissions are simultaneously made from the *same* end of the line, the system is called *diplex telegraphy*. (See *Telegraphy*, *Diplex*.)

**Telegraphy, Dial** — — A system of telegraphy in which the messages are received by the motions of a needle over a dial plate. (See *Telegraphy*, *Step-by-Step*.)

**Telegraphy, Diplex** — — A method of simultaneously sending two messages in the same direction over a single wire.

Diplex telegraphy is to be distinguished from duplex telegraphy, where two messages are simultaneously transmitted over a single wire in *opposite* directions.

**Telegraphy, Double-Needle** — — A system of needle telegraphy in which two separate and independently operated needles are employed.

This system differs from the single-needle system only in the fact that two needles, entirely independent of each other, are mounted side by side, on the same dial, so as to permit their simultaneous operation by the right and left hand of the

Each needle has therefore a separate increase in speed of signaling thus obtained, however, sufficiently great to balance the expense of construction. Single-needle relays, therefore, are preferred to those with two needles.

**Telegraphy, Duplex, Bridge Method of** — A system whereby two telegraphic messages can be simultaneously transmitted on a single wire in opposite directions.

As duplex telegraphs have been devised, the *Bridge Duplex* is shown in Fig. 528. The relay is placed in the cross wire of a *Wheatstone Bridge*. (See *Bridge, Electric*.)

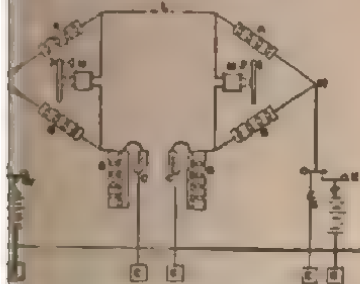


Fig. 528. Duplex Telegraphy, Bridge Method.

the ends of this cross wire are at the terminals, which will occur when the resistances of the four arms are proportionately equal, no current passes.

Battery is connected through the transmitting key, which is arranged so that the battery is made before the connection of the line is broken, to H, where the circuit is closed to form the arms of the bridge. Adjustances A, B, are placed in the two arms of the bridge.

The wire 1, connected as shown, forms the third arm, and a rheostat or other adjustable resistance R, connected to a condenser C, as forms the fourth arm. (See *Rheostat*.) A relay M, is placed in the cross wire of the bridge thus formed. Small resistances V, and placed in the circuit of the battery to prevent short circuiting.

Similar disposition of apparatus is provided at the other end of the line. If, now, the four resistances at one end are suitably adjusted, the relays will not respond to the outgoing current; but when an earth circuit is employed, it will

respond to the incoming current. The relay at either end, therefore, will only respond to signals from the other end. The operator may thus signal the distant station while, at the same time, his relay, not being affected by his sending, is in readiness to receive signals from the other end.

**Telegraphy, Duplex, Differential Method of** — A system of duplex telegraphy in which the coils of the receiving and transmitting instruments are differentially wound.

A differential system of duplex telegraphy is shown in Fig. 529. The coils of the receiving and transmitting galvanometers at A and B, are differentially wound. One of the coils of A, is connected to that of B, through the line, as shown; and the other, in each to the rheostats at R, and R'. As these coils are differentially wound, when equal currents flow in opposite directions through either of the instruments at A and B, no deflection of the galvanometer occurs.

The battery at A, has its copper terminal, and that at B, its zinc terminal, connected to earth. When the keys at A and B, are depressed simultaneously, the currents sent into the line flow in the same direction and strengthen each other.

Suppose now that only the key at A, be depressed. The current divides equally between the rheostat and line, the resistance  $e a b h a' e'$ ,  $r'$ , being made equal to the resistance  $e c d R$ .

This current passes through both coils of the instrument at A, and produces no deflection of the needle; but since it only passes through one coil at B, it deflects the galvanometer needle, and produces a signal.

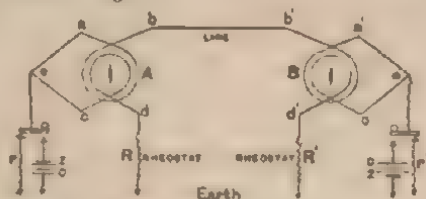


Fig. 529. Duplex Telegraphy, Differential Method.

If the keys at A, and B, are simultaneously closed, the effect on the line is to add the current of the two batteries, but each rheostat circuit is traversed by its own battery current only.

The line connected coils of the galvanometer have, therefore, the stronger currents flowing through them, and the needles of both are moved, just as if, with a single battery discharging into the line, its resistance had been decreased. Each

sender's instrument is unaffected by the currents he sends into the line, and is, therefore, ready to be operated by the currents sent into the line by the sender at the other end of the line.

The two currents in duplex telegraphy, therefore, do not pass each other on the line; on the contrary, they are sent into the line in the same direction.

Since, when either key is moving there is a small interval of time when the circuit is broken for incoming currents, the keys are generally made so as to close the second contact before breaking the first.

In order to avoid disturbing the balance on the introduction of the resistance of the batteries at A or B, on closing the circuits, an equal resistance is added at  $r$  and  $r'$ , between the back stop and the earth.

Since the proper operation of duplex telegraphy requires a balance in the resistance of the circuits of the differentially wound coils, a rheostat at R, and R', is necessary.

Besides balancing the line for resistance, it is necessary to balance it for capacity. A condenser is, therefore, necessary when the circuit exceeds in length about 100 miles, or has much cable or underground wire.

**Telegraphy, Fac-Simile** — —A system whereby a fac-simile or copy of a chart, diagram, picture or signature is telegraphically transmitted from one station to another.

Fac-simile telegraphy is sometimes called autographic telegraphy, or pantelegraphy.

Bakewell's fac-simile telegraph, which was one of the first devised, consists of two similar metal cylinders  $c$ ,  $c'$ , arranged at the two ends of a telegraph line  $L$ , at M and M', as shown in Fig. 530. These cylinders are synchronously rotated

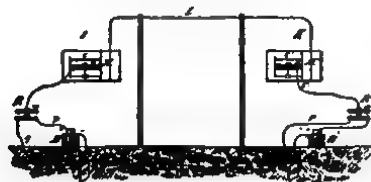


Fig. 530. Bakewell's Fac-Simile Telegraphy.

and provided with metallic arms or tracers  $r$ ,  $r'$ , placed on a horizontal screw in the line circuit and moved laterally over the surface of the cylinder on its rotation.

At the transmitting station the chart, writing,

or other design is traced with varnish, or other non-conducting liquid, on the surface of the metallic cylinder, as at M, and a sheet of chemically prepared paper, similar to that employed in the Bain chemical system is placed on the surface of the receiving cylinder at M'. (See *Recorder, Chemical, Bain's.*)

The two cylinders being synchronously rotated, the metallic tracer breaks the circuit in which it is placed when it moves over the non-conducting lines on the cylinder, and thus causes corresponding breaks in the otherwise continuous blue spiral line traced on the paper-covered surface of M'.

The telegraph keys at R, R', are used for the purposes of ordinary telegraphic communication before or after the record is transmitted.

Caselli's Pan-Telegraph is an improvement on Bakewell's Copying Telegraph. Better methods are employed for maintaining the synchronism between the transmitting and receiving instruments, for which purpose a pendulum, vibrating between two electro-magnets, is employed.

**Telegraphy, Fire Alarm** — —A system of telegraphy by means of which alarms can be sent to a central station, or to the fire engine houses in the district, from call boxes placed on the line.

The alarms are generally sounded by an apparatus similar to a district call, so that the pulling back of a lever rotates a wheel, by means of which successive makes and breaks are produced, the number and sequence of which enable the receiving stations to locate the particular box from which the signal is sent.

In the case of some buildings, the alarms are automatic, and either call for help from the central office, or for the watchman in the building, or else turn on a series of water faucets or jets, in order to extinguish the fire. In these cases *thermostats* are used. (See *Thermostat.*)

**Telegraphy, Gray's Harmonic Multiple** — —A system for the simultaneous transmission of a number of separate and distinct musical notes over a single wire, which separate tones are utilized for the simultaneous transmission of an equal number of telegraphic messages.

The separate tones are thrown into the lines by means of *tuning forks* automatically vibrated by electro-magnets. These forks interrupt the

batteries connected with the main line ending end of the line.

Composite tone thus formed, is separated into component tones by receiving electro-instruments called *harmonic receivers*, the armature of which consists of a steel ribbon or cord to one of the separate notes sent into the line.

As the complex or undulatory current passes through the coils of each harmonic receiver, each note only affects the particular armature, which vibrates in unison with its ribbon or cord. The operator, therefore, at this receiver communicates only with the operator at the other end of the circuit that is sending this particular note into the line. The same is true of the other receivers.

Morse alphabet is used in this system, the dashes being received as musical tones. It was found that there was no difficulty in each operator recognizing the particular instrument in receiving, although the instruments were in the same room.

Subsequent invention the signals received were introduced into the regular Morse characters by means of an ingenious device.

**Telegraphy, Induction** — — A system of telegraphing by induction between moving and fixed stations on a railroad, by means of impulses transmitted by induction between the car and a wire parallel with the

systems of inductive telegraphy are in use.

**Static Induction system** of W. W. Channing and Edison, and

**Current or Dynamic Induction system** of L. Smith and Lucius J. Phelps.

**System of Static Induction**, one of the systems which receives or produces static electricity, consists of a wire placed on the road some as near the top of the cars of the train as possible. The other condensing surface is composed of the metal roofs of the moving

cars. The condensing surface is connected to suitable instruments and batteries, and to the earth, the wire at the fixed station being connected through a ground plate, and the metal roof of the car to earth through the wheels and

under these circumstances variations in the length of the condensing surfaces pro-

duce inductive impulses that are received by the other surface as telegraphic signals.

The Morse alphabet is employed, but in place of the ordinary receiver or sounder, a telephone is used.

**In the System of Current Induction**, the line wire is placed near the track, so as to be parallel with a coil of insulated wire placed on the side of the car, and which receives the inductive impulses. The coil of wire on the train is connected with instruments and batteries, and forms a metallic circuit. The line wire is also connected with suitable batteries and receiving and transmitting instruments.

An induction coil is generally employed, since the greater and more rapidly varying difference of potential of its secondary wire renders it better suited for producing effects of induction. A telephone is employed as a receiver, as in the system of static induction. The metallic car roof and the lower truss rods have been successfully used as the secondary conductor of the induction coil.

The automatic make-and-break used for operating the induction coil, causes the Morse characters employed in this system to be received in the receiving telephone as shrill buzzing sounds.

The receiving telephones used on the trains have a resistance of about 1,000 ohms.

**Telegraphy, Induction, Current System of** — — A system of induction telegraphy depending on current induction between a fixed circuit along the road, and a parallel circuit on the moving train.

The circuit on the train generally consists of a coil of wire. (See *Telegraphy, Induction*.)

**Telegraphy, Induction, Dynamic System of** — — A term sometimes used in place of a system of telegraphic current induction. (See *Telegraphy, Induction*.)

**Telegraphy, Induction, Static System of** — — A system of inductive telegraphy depending on the static induction between the sending and receiving instrument.

A fixed wire placed along the road so as to come near another wire or metallic surface on the moving train, imparts to the latter a static charge, which is utilized for the transmission of dispatches. The metal roof of the car is generally used for the condensing surface receiving the charge. (See *Telegraphy, Induction*.)



**Telegraphy, Machine** — A term sometimes applied instead of automatic telegraphy. (See *Telegraphy, Automatic*.)

A system of telegraphy is properly called machine telegraphy when both the transmission and the receiving of the telegraphic messages are accomplished by machine, instead of by the hand, as usual.

**Telegraphy, Morse System of** — A system of telegraphy in which makes and breaks occurring at intervals corresponding to the dots and dashes of the Morse alphabet are received by an electro-magnetic sounder or receiver.

A metallic lever A, Fig. 531, is supported on a pivot at G, between two set screws D, D, so as to have a slight movement in a vertical plane. This motion is limited in one direction by a stop at C, called the *normal* or *front contact*, and in the other direction by a set screw F, which constitutes its *back stop*.

The front stop C, is provided with a platinum contact or stud, which may be brought into contact with, or separated from, a similar stud placed directly opposite it. These contacts are connected to the ends of the circuit so that on

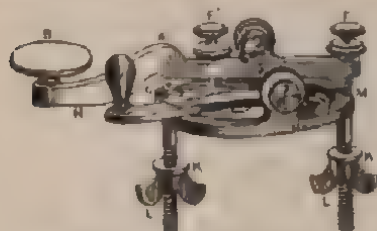


Fig. 531. *Telegraphic Key.*

the movements of the key, by the hand of the operator placed on the insulated head B, the line is closed and broken in accordance with the dots and dashes of the Morse alphabet. A spring, the pressure of which is regulated by the screw F, is provided for the upward movement of the key. A switch H, is provided for closing the line when the key is not in use.

The system generally used in the United States is known as the "Closed-Circuit System," the battery being connected to line whether the line is in use or not. This battery is generally placed at both ends of the line.

In Europe, the "Open-Circuit System" is gen-

erally used. Alternating currents and polarized relays are employed. One pole is connected to the line at the front of the key, and the other pole to the back of the key. When the line is not in use, it is connected to earth at both ends by switches conveniently placed for the operators. With this system, intermediate stations must each have a main battery, while in the closed-circuit system, the terminal batteries answer for all intermediate offices, which in some cases amount to as many as fifty.

In the Morse system, each station is provided with a key, relay, sounder or register, and local battery. The closed-circuit, connecting one station with another, being broken by the opening of the switch H, or the working of the key, so as to open and close its contacts, the armature of the relay opens or closes the circuit of the local battery and operates the sounder or registering apparatus connected therewith. (See *Sounder, Morse Telegraphic Apparatus, Registering, Telegraphic*.)

**Telegraphy, Multiplex** — A system of telegraphy for the simultaneous transmission of more than four separate messages over a single wire. (See *Telegraphy, Synchronous-Multiplex, Delany's System*.)

**Telegraphy, Needle System of** — A system of telegraphy in which signals are transmitted by means of the movements of needles under the influence of the electric current. (See *Telegraphy, Single-Needle*.)

**Telegraphy, Phonoplex** — A system of telegraphic transmission in which pulsatory currents, superposed on the ordinary Morse currents, actuate a modified telephonic receiver, and thus permit the simultaneous transmission of several separate messages over a single wire without interference.

**Telegraphy, Printing** — A system of telegraphy in which the messages received are printed on a paper fillet.

In Callahan's Printing Telegraph, two type wheels are employed, one of which carries letter type and the other numerals on its circumference. These *printing wheels* are placed alongside of each other, as shown in Fig. 532, but on separate and independent axes.

The type wheels are moved by a step by step device. The impulses necessary to bring the



desired letters in position for printing are automatically sent by a circuit maker and breaker. These impulses are sent into the line by the depression of keys on a suitably arranged key-board.

When the proper letter or numeral is reached at the receiving end, the printing wheel is stopped, and a paper fillet is pressed against its surface. The printing wheel is kept covered with ink by means of an inked roller.

The transmitting instrument is similar in its operation to the Breguet manipulator. Separate transmitters are used for each of the wires. (See *Telegraphy, Step-by-Step*.)

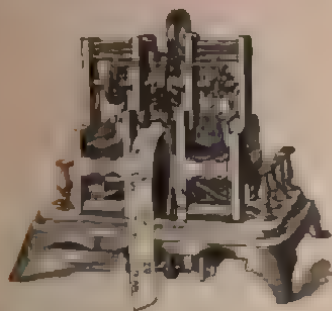


Fig. 532. Callahan's Printing Telegraph.

**Telegraphy, Quadruplex** — A system for the simultaneous transmission of four messages over a single wire, two in one direction and the remaining two in the opposite direction.

Quadruplex telegraphy consists in fact of duplex telegraphy duplexed.

There are various systems of quadruplex telegraphy. The most important are the *bridge method* and the *differential method*. (See *Telegraphy, Quadruplex, Bridge Method of*. *Telegraphy, Quadruplex, Differential Method of*.)

**Telegraphy, Quadruplex, Bridge Method of** — A system of quadruplex telegraphy by means of a double bridge duplex system. (See *Telegraphy, Quadruplex*.)

In the bridge method of quadruplex telegraphy, as in the differential method, changes in the polarity and strength of the current are utilized to establish a double duplex system of transmission.

Fig. 533 from Prescott's "Electricity and Electric Telegraphy," from which the following description

is taken, shows the method first employed by the Western Union Telegraph Company in 1874.

A double current transmitter, or pole changer, is shown at T', with its operating key K' and local battery e'. This instrument interchanges the poles of the main battery E, when K' is depressed, and thus reverses the polarity of current on the line.

The increment transmitter T<sup>2</sup>, is connected to the battery wire 12 of T, in such a way that when K' is depressed, the main battery E, is placed in series with battery E', of say twice the strength of E, thus permitting a current of three-fold the original strength to be sent into the line.

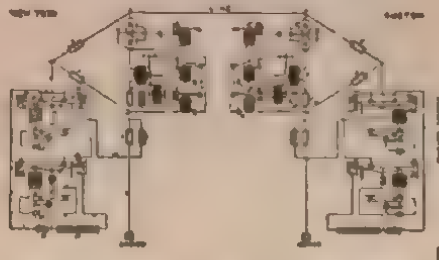


Fig. 533. Quadruplex Telegraphy, Bridge Method.

Two receiving instruments R' and R<sup>2</sup>, are placed at the distant end of the line. R' is a polarized relay whose armature is deflected in one direction by positive currents, and in the opposite direction by negative currents, independently of their strength. That is to say, R', responds to changes in the direction of the currents that pass through its coils, but not to changes in their strength. (See *Relay, Polarized*.)

Relay R<sup>2</sup>, is non-polarized and the movements of its soft iron armature depend on a change in the strength of the current only. That is to say, R<sup>2</sup>, responds to changes in the strength of the current passing through its coils, but not to changes in their direction.

These two relays R' and R<sup>2</sup>, are placed in the bridge wire of a Wheatstone bridge. The entire apparatus of transmitting keys and relays is duplicated at each end of the line. Under these conditions, signals transmitted from either end of the line affect the instruments at the other end of the line, but not their own instruments, in the same manner as in the case of the *bridge duplex*. (See *Telegraphy, Duplex, Bridge Method of*.)

**Telegraphy, Quadruplex, Differential**

**Method of** — A system of quadruplex telegraphy by means of a double differential duplex system.

Quadruplex telegraphy depends for its operation on the use of two differentially wound relays at each station. One of these relays A, as shown in Fig. 534, which shows the general arrangement of the system, gives signals on a change in the direction of the current, but none on a change in the current strength. The other B, gives signals on changes in current strength, but none on changes in direction. They are, therefore, independent of each other, and operate sounders that are under the independent control of two distinct receiving operators.

A table, divided into four sections, is provided with places for two sending and two receiving clerks. The name "A side" is given to the side worked by the reversed currents, and the "B side" to that worked by the strengthened currents.

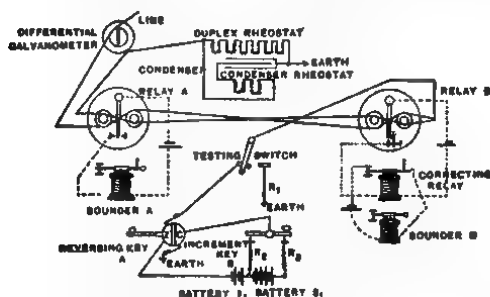


Fig. 534. Quadruplex Telegraphy, Differential Method.

Referring to Fig. 534 the reversing key on the "A side" is merely indicated so as to avoid confusion by too great detail; as is also the case with the increment key or the strengthening key at B. From the connections it will be seen that when the increment key is at rest, the reversing key sends currents from battery 1. When the increment key is depressed, the reversing key is shifted from battery 1, and connected by its copper connection C, with the battery 2, of double the strength of 1. Since, however, 1, is thus connected in series with C, the current strength is increased threefold.

From the reversing key the current passes to the junction of the two coils with which the relay B, is differentially wound. It divides here between these coils, which are connected to simi-

lar coils on relay A, as shown. The current from one coil on A, is sent to line, while that from the other coil goes to earth through the compensating rheostat. This arrangement forms a duplex system, the outgoing currents of which have no effect on the home relays.

Resistances  $R^1$  and  $R^2$ , are connected to the batteries 1 and 2, and the stops in the increment key in the manner shown, to the resistance of  $R^2$  and  $R^3$ . The former is used in order to maintain the resistance of the circuit, whether the battery is in or out of circuit. The latter is called the spark coil, and is intended to decrease the sparking on closing circuit.

When both are at rest, battery 1, has its zinc connected to line through A, and its copper to earth through  $R^1$ , C 1, the lever of key B and key A, which last two are permanently connected. A reversed or spacing current goes to line, without affecting the home relays, since it passes in opposite directions and with equal strength through differentially wound coils.

When, however, the key A, is worked alone, it reverses the current and the signal is recorded by the distant relay A.

If key B, is worked alone, it breaks connection with copper at the junction of the two batteries, and makes contact with terminal copper of battery 2, so as to send a zinc current of threefold strength. The distant relay B, records a signal because the current is now strong enough to move it. Relay A, however, is not affected, since the current has not been reversed.

When both keys are simultaneously in action, then whenever B, is pressed, although the strength of A, may be increased, since its direction is not changed, the polarized tongue of its relay is unaffected by the movement of B, but any increase of current causes the armature of the distant relay of B, to move.

This armature is held in position by springs of such a strength as to prevent its motion by a weak current, and being unpolarized, responds to either positive or negative currents. It, therefore, responds to B, and records a signal. When A, is pressed, it reverses the current, and consequently moves the distant relay A, but has no effect on B, since it causes no alternation in the strength of the current.

The author has taken the above almost literally from Culley's "Handbook of Practical Telegraphy," to which the reader is referred for a fuller description and details of apparatus.

**Telegraphy, Simplex** — A system of telegraphy in which a single message only can be sent over the line.

**Telegraphy, Single-Needle** — A system of telegraphy by means of which the

movements of the observer represent the dashes, and movements to the left, the dots of the Morse alphabet.

The single needle apparatus of Wheatstone and Cooke's system is shown in Figs. 535, and 536. Fig. 535, shows the external appearance, and Fig.

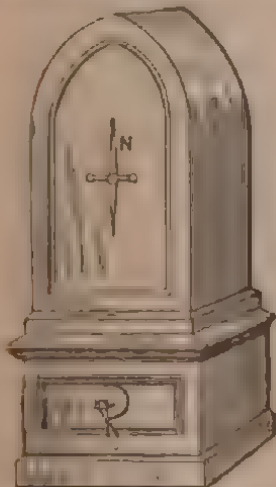


Fig. 535. Single-Needle Telegraphic Apparatus.

Signals transmitted are received by observing the movements of a vertical needle over a scale.



Fig. 536. Wheatstone and Cooke's Single-Needle Apparatus. Internal Arrangement.

Movements of the top of the needle to the right



Fig. 537. Wheatstone and Cooke's Single-Needle Apparatus. External View.

Fig. 536, the internal arrangements as seen from the back. An astatic needle is placed inside two coils of insulated wire C C. Only one of these needles N, is visible on the face of the receiving instrument. The current from the line enters at L, passes through the coil C C, and leaves at N.

The movements of the needle to the right or the left are obtained by changing the direction of the current in the coils C C. This is effected by working the handle when sending, and thus moving the commutator at S, S, and bringing the contact springs resting thereon into different contacts.

In the more modern form of single-needle instrument shown in Fig. 537, a single magnetic needle N S, Fig. 538, only is placed in the coil.

This needle is rigidly attached to a light needle a, b, used only as a pointer, and is alone visible in the front of the instrument. The relative disposition of these needles is shown in Fig. 538.

The reversals of the current, required to deflect the needle to the right or left, are obtained by

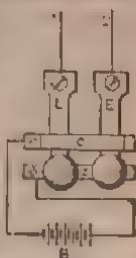


Fig. 538. Needle and Pointer.

means of a *double key or tapper*, shown in Fig. 539.

The levers L and E, are connected respectively to line and earth, and, when not in use, rest against C, connected with the positive side of the battery; but when depressed connect with Z, attached to the negative side of the battery.

The depression of L, therefore, sends a negative current into the line and deflects the needle, say, to the left, while the depression of E, sends a positive current into the line and deflects the needle Fig. 539. *Double* to the right. The terms *positive Key or Tapper*, and *negative currents* are used in telegraphy to indicate currents whose *direction* is positive or negative.



**Telegraphy, Speaking** — — A system for the telegraphic transmission of articulate speech. (See *Telephone*.)

**Telegraphy, Step-by-Step** — — A system of telegraphy in which the signals are registered by the movements of a needle over a dial on which the letters of the alphabet, etc., are marked.

Dial telegraphs are especially employed for communication by those who are unable to readily read the Morse characters.

The annexed instrument, devised by Breguet, was formerly used on some of the railway systems of France.

A needle advances over a dial by a step-by-step

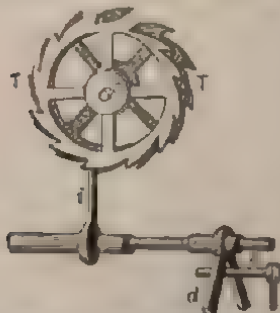


Fig. 540. Step-by-Step Wheel.

movement in one direction only. The alternate to-and-fro motions of the armature of an electro-magnet are employed to impart a step-by-step motion to a peculiarly shaped toothed wheel

T, T, Fig. 540, through the action of a horizontal arm c, attached thereto and moving between the two prongs of a fork d vibrating on a horizontal axis to which is attached a vertical pallet i.

The receiving instrument is called the *indicator*, and consists of a needle attached to the axis of this wheel. The needle moves over the face of

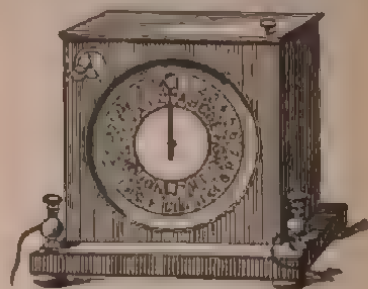


Fig. 541. Breguet's Indicator.

the dial, shown in Fig. 541, on which are marked the letters of the alphabet and the numerals.

The sending instrument is called the *manipulator*. It consists of a device for readily sending over the line the number of successive impulses required to move the needle step-by-step from any letter on the indicator to which it may be pointing, to the next it is desired to send.

The dial, shown in Fig. 542, is marked on its face with the same characters as the indicator. The edge of the wheel is provided with twenty-six notches in which a pin attached to a movable arm engages. The arm is jointed so that it can be placed in any of the notches on the face of the wheel.

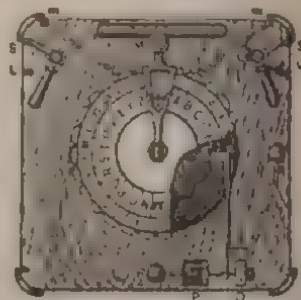


Fig. 542. Breguet's Manipulator.

Below the dial face, and attached to the same axis as the movable arm, is a wheel provided with undulations consisting of thirteen elevations and thirteen depressions.

A lever T, pivoted at a, rests in these undulations at its upper end, and plays between two contact points at P and Q.

If, now, the dials of the indicator and the manipulator both being at O, a movement is given to the arm by the handle M, to any point on the manipulator, there are thus produced the required number of makes and breaks to move the needle of the indicator to the corresponding letter or character.

**Telegraphy, Submarine** — A system of telegraphy in which the line wire consists of a submarine cable.

In long submarine cables, in order to avoid *retardation* from the self-induction of the current, and the *static charge* arising from the cable acting as a condenser, very small currents are used. To detect these a very sensitive receiving instrument, such as the *mirror galvanometer*, or the *siphon recorder*, is employed. (See *Galvanometer, Mirror, Recorder, Siphon*.)

According to Culley, the retardation in the case of one of the submarine cables between Newfoundland and Ireland, amounts to *two-tenths of a second* before a signal sent from one end produces any appreciable effect at the other end, while *three-tenths of a second* are required for the current through the cable to gain its full strength.

**Telegraphy, Synchronous-Multiplex, Delany's System** — A system devised by Delany for the simultaneous telegraphic transmission of a number of messages either all in the same direction, or part in one direction and the remainder in the opposite direction.

The Delany system embraces the following parts:

(1.) A circular table of alternately insulated and grounded contacts at either end of a telegraphic line.

(2.) A synchronized rotating arm or trailing contact, at each end of the line, driven by a *phonus wheel*, and maintained in synchronous rotation by means of electric impulses automatically sent out over the main line in either direction, on the failure of the wheel at either end to rotate synchronously with that at the other end.

(3.) Transmitting and receiving instruments connecting similar contacts at each end of the main line, and forming practically separate and independent lines for the simultaneous transmis-

sion of dispatches over the main line in either direction.

The main line is simultaneously connected at both of its ends to corresponding operating instruments, and transferred from one set of instruments to another so rapidly that the operators, either sending or receiving, cannot realize that the line has been disconnected from their instruments and given to others, because each of them will always have the line ready for use, even at the highest rate of manipulation, and will, therefore, to all practical intents and purposes, have at his disposal a private wire between himself and the operator with whom he is in communication.

Therefore, although more than one operator may be spoken of as simultaneously using the line at any given time, yet in reality no two operators are absolutely using it at the same time; but they follow one another at such short intervals, and the line is taken from one operator and transferred to another so rapidly, that none of them can at any time tell but that he has the line alone, and that therefore it is practically open for the use of every operator just as if he alone had control of it.

There will, therefore, be established, by the use of a single line, as many private and separate lines as there are transferences of the line from the time it is taken from the first operator, and again given back to him.

This system has been extended to as many as seventy-two distinct and separate printing circuits, maintained and operated on a single connecting line wire.

The speed at which the circuits may be operated is in the inverse order of the number of circuits organized. The best results, practically, are obtained from six divisions of the contacts in the circle, which gives each operator about 36 contacts with the line per second, a speed which admits of the highest rate of transmission on each of the six circuits.

Fig. 543 shows the apparatus at each end of the line, at the stations X and Y. The apparatus at each end is substantially identical. A steel fork a, at each station, is automatically and continuously vibrated by the action of the local battery L, B, and the electro-magnet A, called the *vibrator magnet*.

Platinum contacts x, x', placed on the inner faces of the tines of the fork, make and break contact with delicate contact springs y, y'.



The fork being mechanically started into a vibratory motion, will automatically make and break its local circuit, and thus send impulses into the fork magnet A, that will continuously maintain the vibrations of the fork, in a well known manner.

The making and breaking of the contacts x and y, consequent on the fork's vibration, open and close another local battery placed in a circuit called the motor circuit, in which is also placed an electro-magnet D, the function of which is to maintain the continuous rotation of the transmission apparatus C.

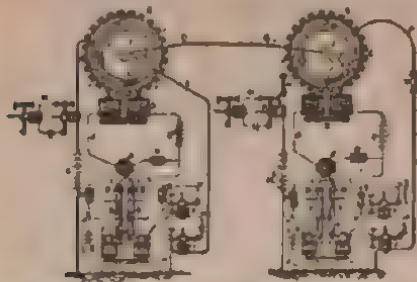


Fig. 543. Edison's Synchronous Multiplex Telegraph

The continuous vibration of the fork makes and breaks the contacts at x and y, and thereby makes and breaks the motor circuit. The alternate magnetizations and demagnetizations of the cores of the motor-magnet D, cause the rotation of the transmission apparatus C.

The motor magnet and transmission wheel or disc C, provided with projections c, c, is the invention of Paul La Cour, and is styled by him a "phonic wheel."

The transmission apparatus is illustrated in detail in Figs. 544 and 545, and is an exact counterpart of the receiving apparatus at the other end of the line. A base plate E, provided with



Fig. 544. The Phonic Wheel

landing posts, carries a vertical rotary shaft F. A circular table F<sup>1</sup>, is provided with a series of insulated contacts arranged symmetrically around the axis of rotation of the shaft. A radial arm F<sup>2</sup>, connected with the shaft F, carries at its outer extremity a trailing contact finger f. As the

disc C, is rotated by the electro-magnet D, the trailing contact f, sweeps around the circular

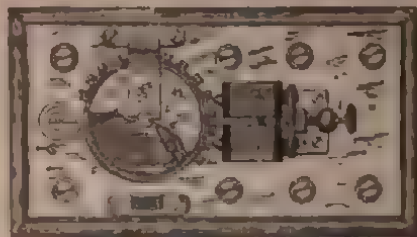


Fig. 545. The Phonic Wheel.

table F<sup>1</sup>, and is brought successively into contact with the insulated contact pieces placed on the upper face of the table F<sup>1</sup>.

The main line Q, Q, has one of its ends connected with the trailing finger f. As the shaft F, rotates, the line is therefore brought into successive electrical connection with the series of insulated contacts in the upper face of the table F<sup>1</sup>.

Any suitable number of insulated contacts may be placed on the circular table F<sup>1</sup>; sixty are shown in Fig. 546. In practice these contacts are connected in accordance with the number of circuits which it is desired to simultaneously maintain on the same wire. In the special case shown in the figure above referred to, it is arranged so that four separate circuits shall be established on the same line wire.

The sixty contacts are placed in six independent series, numbered from 1 to 10, consecutively. In the arrangement here shown two of the contact pieces in each series of ten are connected in the same circuit, and, as there are six series, each of the circuits so connected will have twelve contacts for each rotation of the disc, and twelve electrical impulses, as will be afterwards described.

The detailed mechanism, by means of which the separate and independent circuits so obtained are utilized for the transmission and reception of messages, is shown in Fig. 546. R, R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup>, are polarized relays, S, S<sup>1</sup>, S<sup>2</sup> and S<sup>3</sup> are ordinary Morse sounders, although in the practice of this invention some improvement has been introduced in connection with the receiving instruments. The connections with the main and the local batteries M B and L B, are clearly shown in the figure.

It will be noticed that the relay R, is connected

with the wire  $r$ , and with the contacts 1 and 5;  $R^1$  is connected by  $r^1$ , with the contacts 2 and 6,  $R^2$ , by the wire  $r^2$ , with the contacts 3 and 7, and  $R^3$ , by the wire  $r^3$ , with the contacts 4 and 8. Similar instruments and circuits are placed at each end of the line.

Without further describing the operation of the instruments shown in the figure, it need only now be borne in mind that the corresponding relays at the distant stations are connected with the correspondingly numbered contacts. When, therefore, the trailing contact finger at each station simultaneously touches the contacts bearing the same number, the corresponding instruments connected

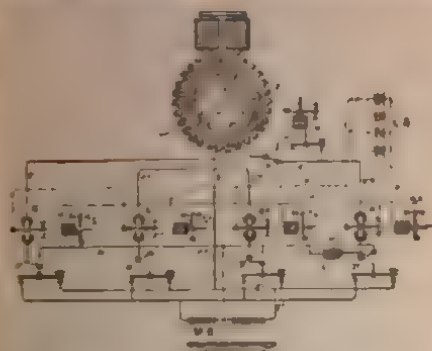


Fig. 546. Working and Receiving Currents.

with these contacts at each station will be placed in communication over the main line, the trailing contact finger  $i$ , completing the connection of the main line with the contact arm in the manner already described.

**Telegraphy, Time** — — A system for the telegraphic transmission of time.

A system of time telegraphy includes a *master clock*, the movements of whose pendulum automatically transmit a number of electric impulses to a number of *secondary clocks* and thus moves them; or self winding clocks are employed, which are corrected daily by an impulse sent over the line from a master clock. (See *Clock, Electric*.)

**Telegraphy, Writing** — — A species of fac-simile telegraphy, by means of which the motions of a pen attached to a transmitting instrument so vary the resistance on two lines connected with a receiving instrument as to cause the current received thereby to reproduce the motions, on a pen or stylus, which transfers them to a sheet of paper.

A system of writing telegraphy consists essentially of transmitting and receiving instruments connected by a double line wire.

The transmitting instrument is shown in Fig. 547.

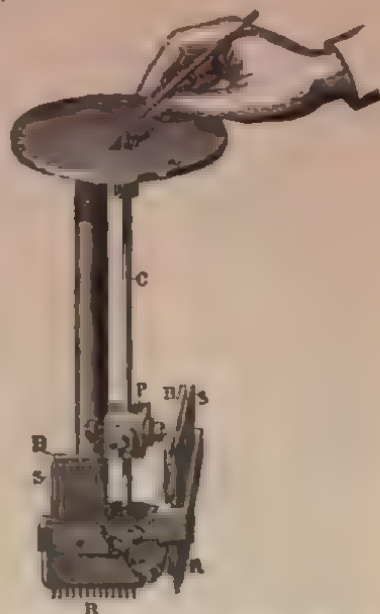


Fig. 547. Transmitter of Writing Telegraphy.

A stylus or pen resting on a top plate, is connected by the rod  $C$ , with a series of steel contact springs  $S, S$ , secured to the base and placed at right angles to one another. A series of resistances  $R, R$ , are connected with the lower ends of these contact springs. Two contact bars,  $B, B$ , are provided on the side facing the springs with platinum contacts opposite the contacts on the springs. The stylus rod  $C$ , is securely fixed to the base, but a spring at the lower end permits of its free movement. A pressure block at  $P$ , is fastened to the stylus rod, as shown, and in its normal position the pressures are adjusted so that contact is secured with the first spring.

A movement of the stylus, as in writing, presses the contact bar against the spring, varying the position and number of contacts, and thereby cutting in or out the resistance necessary to effect the proper movement of the receiving pen.

The receiving instrument is shown in Fig. 548. It consists of two electro-magnets placed at right angles to each other. A double armature sup-

ports the receiving stylus or pen in the manner shown. The variations in the current sent over the line by the varying resistances introduced into the circuit, or cut out or in by the action of the transmitting stylus, causes variations in the position of the double armature, under the varying magnetic attraction of the receiving electromagnet, and thus causes the receiving pen to correctly reproduce the motions of the transmitting pen.

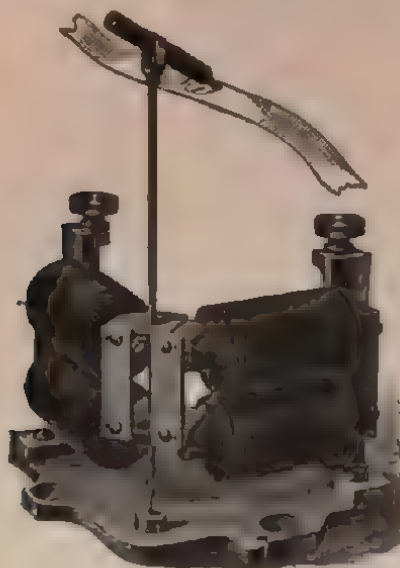


Fig. 548. Receiver of Writing Telegraph

This system has been operated over a line nearly 500 miles in length, when it successfully reproduced written characters.

The author is indebted for the drawings and the general facts to the *Electrical Engineer* of New York.

#### Tele-Hydro-Barometer, Electric — —

An apparatus for electrically transmitting to, and recording at a distant station the height of water or other liquid.

#### Tele-Manometer, Electric — —

A gauge for electrically indicating and recording pressure at a distance.

The tele-manometer includes a pressure gauge furnished with electric contacts operated by the movements of the needle of the steam gauge, for instance, and indicating and recording apparatus. An alarm bell is provided to call attention to any

rise of the pressure above or its fall below the given or predetermined limits for which the hands have been set.

**Telemeter.**—An apparatus for electrically indicating and recording at a distance the pressure on a gauge, the reading of a thermometer, or the indications of similar instruments. (See *Tele-Hydro-Barometer, Electric. Tele-Manometer, Electric. Tele-Thermometer, Electric.*)

**Telephone.** To communicate by means of a telephone.

**Telephone.**—An apparatus for the electric transmission of articulate speech.

The articulating telephone, though first brought into public use by Bell, was invented by Reis, in Germany, in 1861. In America, after very protracted litigation, Bell has been decided legally to be the first inventor, but scientific men very generally recognize the principles of the invention to be fully anticipated by the earlier instruments of Reis. Bell, however, is justly entitled to the credit of inventing the first really successful telephone.

In Bell's *magneto electric telephone*, the transmitting and receiving instruments are identical. A coil C, of insulated wire connected with the line, is placed on a core of magnetized steel, mounted opposite the centre of a circular diaphragm of thin sheet iron, rigidly supported at its edges.

In transmitting, the message is spoken into the mouth piece at one end, as at D, in Fig. 549, and the to and-fro motions thus imparted to the metallic

diaphragm attached to the mouth piece P, produce induction currents in the coil C, on the magnet M. (See *Induction, Electro-Dynamics.*) These impulses, passing over the main line E L, Fig. 550, produce similar movements in the diaphragm P', of the receiving instrument, at D', and thus cause it to reproduce the message, in articu-



Fig. 549. Telephone.

late sounds, to one listening at the receiving instrument. A ground circuit is shown in the figure, as usually employed in practice, except for long distance and in large cities.

A magneto-telephone constitutes in reality a magneto electric machine, driven or propelled by the voice of the speaker, in which the currents so produced instead of being commuted are employed uncommuted to reproduce the uttural speech.

In actual practice the instrument above described is replaced by the *electro-magnetic tele-*

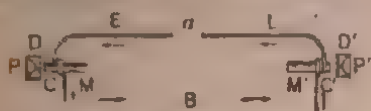


Fig. 550. Telephone Circuit.

*phone*, in which the to-and fro motions of the transmitting diaphragm are caused to vary the resistance of a *button of carbon*, or a *variable contact transmitter* similar to that employed by Reis in some of his instruments. The variable resistance is placed in the circuit of a battery, so that on speaking into the transmitter, electric impulses are sent over the line and are received by a telephone with a magnet core provided with a coil in the main-line circuit.

The telephone is arranged for actual commercial use in the United States in the manner Fig 551. *Telephone Apparatus.*



**Telephone, BI** — — A term sometimes applied to a double telephone receiver so arranged as to permit of easy application to both ears of the listener at the receiving instrument.

**Telephone Cords.**—(See *Cords, Telephone.*)

**Telephone, Electro-Capillary** — — A telephone in which the movements of the transmitting diaphragm produce currents by means of variations in the electromotive forces of the contact surfaces of liquids in capillary tubes. (See *Phenomena, Electro-Capillary.*)

In Breguet's telephone both the transmitting and the receiving instruments are similar in con-

struction and operate by means of electro-capillary phenomena. A vertical capillary tube communicates at its upper end with an air space below a diaphragm, and at its lower end with a mercury surface on which rests a layer of acidulated water.

A line wire connects the mercury reservoirs of the transmitting and receiving instruments, the remainder of the circuit being formed by another wire connecting the mercury near the upper parts of the two vertical tubes.

The alterations in the contact surfaces at the transmitting end produced by the movements of the diaphragm, cause electric impulses that produce similar movements of the diaphragm at the receiving end.

**Telephone, Electro-Chemical** — — A name sometimes given to the Edison electromotographic telephone. (See *Telephone, Electro-Motographic.*)

**Telephone, Electro-Motographic** — — A telephone in which the receiver consists of a diaphragm of mica or other elastic material operated on the principle of the electromotograph.

A straight lever, which forms part of the line circuit, is rigidly attached at one end to the centre of the receiving diaphragm, and rests near its other end on the surface of a chalk cylinder moistened with a solution of caustic potash or potassium iodide, maintained in rotation by suitable mechanical means.

Electric impulses being sent into the line by the voice of a speaker talking at a transmitter of ordinary construction reduce the friction between the lever and the cylinder, and produce slipping movements of the lever that reproduce articulate speech in the receiving diaphragm.

**Telephone, Reaction** — — An electromagnetic telephone in which the currents induced in a coil of wire attached to the diaphragm are passed through the coils of the electro-magnet, and thus react on and strengthen it.

**Telephone Switch, Automatic** — — (See *Switch, Telephone, Automatic.*)

**Telephonic.** — Pertaining to the telephone.

**Telephonic Alarm.**—(See *Alarm, Telephonic.*)

**Telephonic Cable.**—(See *Cable, Telephonic*.)

**Telephonic Exchange.**—(See *Exchange, Telephonic, System of*.)

**Telephonic Exchange, System of** — — (See *Exchange, Telephonic, System of*.)

**Telephonic Joints.**—(See *Joint, Telegraphic or Telephonic*.)

**Telephonically.**—In the manner of the telephone. (See *Telephone*.)

**Telephoning.**—Communicating by means of the telephone.

**Telephoto.**—An apparatus for the telegraphic transmission of pictures by means of the action of light on selenium. (See *Telephotography*.)

The telephoto is sometimes called the pherope.

**Telephotography.**—A system for facsimile transmission by means of dots and lines transmitted by means of a continuous current whose intensity is varied by a transmitting instrument containing a selenium resistance. (See *Telegraphy, Fac-Simile, Resistance or Cell, Selenium*.)

The transmitter consists of a dark box mounted on an axis, so as to be capable of a sidewise motion. The picture to be transmitted is thrown continuously on the face of the box by any lantern projection apparatus, and a small opening containing a selenium resistance receives

wise continuous current in the circuit of which the selenium resistance is placed.

The picture is received at the other end on a sheet of chemically prepared paper moved synchronously with the transmitting box.

**Telescope, Reading** — — A telescope employed in electric measurements for reading the deflections of the galvanometer.

The image of numbers on an illumined scale is seen in the mirror through the telescope, shown in Fig. 552.

**Teleseme.**—A self-registering hotel annunciator, by means of which a dial operated in a room indicates on the annunciator the article or service required.

**Telo-Thermometer, Electric** — — An electric recording thermometer for indicating and recording temperature at a distance.

The tele-thermometer consists essentially of a transmitter and a receiver. The transmitter consists of a delicate thermometer provided with suitable contacts. The receiver, which is in circuit with the transmitter, has, in some forms, a recording dial on which a continuous record, for a day or week, is made. In cases where it is desired that a given maximum temperature shall not be exceeded, an alarm bell, connected with contacts on the dial face, is rung.

**Telluric Magnetic Force.**—(See *Force, Magnetic, Telluric*.)

**Telpher Line.**—(See *Line, Telpher*.)

**Telpherage.**—A system for the conveyance of carriages suspended from electric

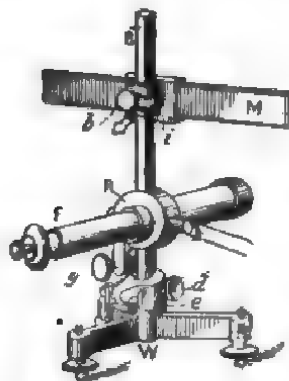


Fig. 552. Reading Telescope.

the alternations of light and shade, and transmits the same as variations in the strength of the other-



Fig. 553. Circuit for Telpherage System.

conductors, and driven by means of electric motors, that take directly from the conductors the current required to energize them.



Two lines are provided, an *up* and a *down* line, that cross each other at regular intervals. Each line is in segments, and the alternate segments are insulated from each other, but are connected electrically by cross-pieces on the supporting posts. In this way the line shown in Fig. 553 is obtained.

The two lines are maintained at a difference of potential by a dynamo-electric machine at D, Fig. 554. As the train at L. T. or L. T', is of such a length as to come into contact with two different segments at the same time, it receives a current sufficient to run the motor connected with it, the current being received through a conductor joining a pair of wheels that are insulated from the truck.

The general arrangement of the line is shown in the annexed Fig. 554.



Fig. 554. Circuit for Telpherage System

**Temperature Alarm.**—(See *Alarm, Temperature*.)

**Temperature, Effects of, on Electric Resistance** — (See *Resistance, Effect of Heat on Electric*.)

**Tempering, Electric** — —A process for tempering metals in which heat of electric origin is employed instead of ordinary furnace heat.

**Temporary Intensity of Magnetization.**— (See *Magnetization, Temporary Intensity of*.)

**Tension, Electric** — —A term often loosely applied to signify indifferently surface density, electromotive force, dielectric stress, or difference of potential.

This term is now very generally abandoned.

**Terminal, Cable** — —A water-tight covering provided at the end of a cable to prevent injury to the cable insulation by the moisture of the air.

**Terminal, Negative** — —The negative pole of a battery or other electric source, or the end of the conductor or wire connected with the positive plate.

**Terminal, Positive** — —The positive pole of a battery or other electric source, or the end of the conductor or wire connected to the negative plate.

**Terminals.**—A name sometimes applied to the poles of a battery or other electric source, or to the ends of the conductors or wires connected thereto.

The two terminals are distinguished as the *positive* and the *negative*. Their names are unlike those of the battery plates to which they are connected, the positive terminal being connected with the negative plate and the negative terminal with the positive plate.

**Terrestrial Magnetism.**—(See *Magnetism, Terrestrial*.)

**Testing, Methods of** — —Various methods for determining the values of the current strength in any circuit, the difference of potential, the resistance, the coulombs, the farads, the joules, the watts, etc. (See *Measurements, Electric*.)

The investigation of an apparatus or circuit for the purpose of determining whether it is in standard or working condition.

**Testing of Joints.**—(See *Joint, Testing of*.)

**Testing Pole.**—(See *Pole, Testing*.)

**Testing Transformer.**—(See *Transformer, Testing*.)

**Tetanus.**—Continuous, spasmodic contraction of the muscles.

**Tetanus, Acoustic** — —Tetanus produced in a muscle by means of alternate currents induced in a coil of wire by a magnetized steel spring vibrating near the coil with sufficient rapidity to give a musical note.

The rapidity of the inductive shock can be determined from the pitch of the musical note; hence the use of the term acoustic.

**Theatrophone.**—A system of telephonic communication between theatres or operas and subscribers, by means of slot machines.

Any person at a café, club, restaurant or other public place, by the theatrophone, is automatically placed in communication with the theatre by means of a receiving telephone so as to hear

the performance by dropping a given piece of money in the slot of the machine.

**Theodolite, Magnetic** — —An apparatus for measuring the declination or variation of the magnetic needle at any place.

A divided circle, like that on a theodolite, is supported horizontally. The needle is formed of a tubular magnet, having an achromatic lens at one end and a scale at the focus of the lens at the other end.

**Theory, Alternation, of Muscular Nerve Current** — —A theory proposed by L. Hermann, in which the currents of nerves or muscular fibres are regarded as a result of their alteration from an original condition.

Hermann states:

(1.) That protoplasm undergoing partial death at any part, either while dying or by metamorphosis, becomes negative to the uninjured part.

(2.) Protoplasm, when excited at any part, becomes negative to the unexcited part.

(3.) Protoplasm, when partially heated at any part, becomes positive, and, on cooling, negative to the unchanged part.

(4.) Protoplasm is strongly polarizable on its surface, the polarization constantly diminishing with excitement and while dying.

According to this theory, passive, uninjured and absolutely fresh tissues are devoid of electric currents. This matter must still be regarded as unsettled. (See *Theory, Molecular, of Muscles or Nerve Current*.)

**Theory, Contact, of Voltaic Cell** — — (See *Cell, Voltaic, Contact Theory of*.)

**Theory, Difference** — —A theory as to the cause of the electric currents excited between injured and uninjured protoplasm.

**Theory, Molecular, of Muscles or Nerve Current** — —A theory proposed by Du Bois Reymond, in which every nerve or muscular fibre is regarded as composed of a series of electromotive molecules arranged in series and surrounded by a neutral conducting fluid.

"The molecules are supposed to have a positive equatorial zone directed towards the surface and two negative polar surfaces directed toward the transverse section. Every fresh transverse section exposes new negative surfaces, and every

artificial longitudinal section new positive areas." — (*Landolt and Sterling*.)

**Theory of Electric Displacement** — — (*Displacement, Electric, Theory of*.)

**Therapeutical Electrization** — — (See *Electrization, Therapeutical*.)

**Therapeutic Bath, Electro** — — (*Bath, Electro-Therapeutic*.)

**Therapeutics, Electro, or Electro-Therapy** — —The application of electricity to the curing of disease. (See *Biology, Electro*.)

**Therapist, Electric** — —One skilled in electro-therapy.

An electro-medical practitioner.

**Therapy, Electro** — —A term sometimes used instead of electro-therapeutics. (See *Therapeutics, Electro, or Electro-Therapy*.)

**Therapy, Magneto** — —Alleged electro-therapeutic effects produced by the movements of magnets over the body of the patient.

It is asserted by eminent authorities that such effects have an actual existence. They should, however, until more carefully investigated, be accepted with extreme caution.

**Therm** — —A heat unit proposed by the British Association.

A therm is the amount of heat required to raise the temperature of one gramme of pure water at the temperature of its maximum density one degree centigrade. (See *Caloric*.)

**Thermaesthesiometer** — —An instrument employed in electro-therapeutics for testing the temperature sense in nervous diseases.

The thermaesthesiometer consists of two thermometers movable on a standard, with flat vessels of mercury in order to readily apply them to the skin. The mercury vessel of one of the thermometers is surrounded by an insulated platinum wire and may be warmed at pleasure by passing a galvanic current through the wire.

The two vessels, brought to different temperatures, are set on the same part of the skin, one after the other, so as to test the sensibility of the skin for the differences in temperature.

**Thermal Absorption** — — (See *Absorption, Thermal*.)

**Thermal Caution.**—(See *Caution, Thermal*.)

**Thermal Incandescence.**—(See *Incandescence, Thermal*.)

**Thermic Balance.**—(See *Balance, Thermic, or Bolometer*.)

**Thermo-Battery.**—(See *Battery, Thermo*.)

**Thermo Call.**—A call operated by means of thermo currents.

**Thermo-Cell.**—(See *Cell, Thermo-Electric*.)

**Thermo-Electric Battery.**—(See *Battery, Thermo-Electric*.)

**Thermo-Electric Cell.**—(See *Cell, Thermo-Electric*.)

**Thermo-Electric Couple.**—(See *Couple, Thermo-Electric*.)

**Thermo-Electric Diagram.**—(See *Diagram, Thermo-Electric*.)

**Thermo-Electric Effect.**—(See *Effect, Thermo-Electric*.)

**Thermo-Electric Inversion.**—(See *Inversion, Thermo-Electric*.)

**Thermo-Electric Pile, Differential** —  
—(See *Pile, Thermo, Differential*.)

**Thermo-Electric Pile or Battery.**—(See *Pile, Thermo-Electric*.)

**Thermo-Electric Power.**—(See *Power, Thermo-Electric*.)

**Thermo-Electric Series.**—(See *Series, Thermo-Electric*.)

**Thermo-Electricity.**—(See *Electricity, Thermo*.)

**Thermo-Electrometer.**—A name sometimes, but not happily, applied to an electric thermometer. (See *Thermometer, Electric*.)

**Thermo-Electromotive Force.**—(See *Force, Electromotive, Thermo*.)

**Thermolysis.**—A term applied to the chemical decomposition of a substance by heat.

Thermolysis, or dissociation, is an effect produced by an action of heat somewhat similar to the effect of electrolysis, or chemical decomposition produced by the passage of an electric current. When a chemical substance is heated, the

vibration of its molecules is attended by an interatomic vibration of its constituent atoms so that a decomposition ensues. If the temperature is not excessive, these liberated atoms recombine with others which they meet. At higher temperatures, however, such recombination is impossible, and a permanent decomposition ensues, called thermolysis or dissociation.

**Thermometer, Electric** — — A device for determining the effects of an electric discharge by the movements of a liquid column on the expansion of a confined mass of air through which the discharge is passed.

**Thermometer, Electric Resistance** — — A thermometer the action of which is based on the change in the electric resistance of metallic substances with changes in temperature.

The electric resistance thermometer is used, among other purposes, for determining the temperature of the sea at different depths. Its operation is based on the electric resistance of two perfectly similar coils of insulated wire, enclosed in separate water-tight copper cases. One coil is placed where the temperature is to be determined, and the other in a vessel of water, the temperature of which is altered until the two coils show the same resistance, when, of course, the temperature of the distant coil is the same as that of the water surrounding the other coil.

**Thermometer Scale, Centigrade** — —  
(See *Scale, Thermometer, Centigrade*.)

**Thermometer Scale, Fahrenheit** — —  
(See *Scale, Thermometer, Fahrenheit*.)

**Thermophone.**—Any instrument by means of which sounds are produced by the absorption of radiant energy. (See *Photophone*.)

A telephone has been constructed in which the motions of the receiving diaphragm are effected by the expansions and contractions of a thin metallic wire connected to the diaphragm and placed in the circuit of the main line.

**Thermostat.** An instrument for automatically maintaining a given temperature by the closing of an electric circuit through the expansion of a solid or liquid.

Thermostats are often used in systems of automatic fire telegraphy and in systems of automatic temperature regulation in connection with indi-



ating instruments for sounding an alarm or giving notice when the temperature changes.

They are operated either on open or closed circuits.

**Thermostat Alarm.**—(See *Alarm, Thermostat*.)

**Thermostat, Closed-Circuit** — — A thermostat maintained normally on a closed circuit.

In closed-circuit thermostats, the adjustment for any degree of temperature within a given range is effected by means of a screw.

**Thermostat, Electro-Pneumatic** — — An instrument for automatically indicating the existence of a given temperature by the closing of an electric circuit on the expansion of a gas.

**Thermostat, Mercurial** — — A thermostat operating by the expansion of a mercury column.

A mercurial thermostat is shown in Fig. 555. One terminal is connected directly with the mercury; the other is placed in the arm to the left. On a certain predetermined temperature being reached, the rise of the mercury column completes the circuit and rings an alarm bell. By connecting the thermostat with an annunciator, the particular locality where an excessive temperature has been reached is indicated. Such a system is in use in a well known system of fire alarm.



Fig. 555. Mercurial Thermostat.

**Thermostat, Open-Circuit** — — A thermostat maintained normally on an open circuit.

In open-circuit thermostats the adjustment for temperature within a given range is effected by varying the distance of the fixed and movable contact points.

**Thermostatic.**—Of or pertaining to a thermostat. (See *Thermostat*.)

**Thompeon's Gauss.**—(See *Gauss, S. P. Thompson's*.)

**Thomson's Gauss.**—(See *Gauss, Sir William Thomson's*.)

**Three-Branched Sparks.**—(See *Spark, Three-Branched*.)

**Three-Filament Incandescent Electric Lamp for Multiphase Circuits.**—(See *Lamp, Electric, Incandescent, Three-Filament, for Multiphase Circuits*.)

**Three-Way Trolley Frog.**—(See *Frog, Trolley, Three-Way*.)

**Three-Wire System.**—(See *System, Three-Wire*.)

**Throttling.**—Choking, or stopping off.

**Through Circuit.**—(See *Circuit, Through*.)

**Through Line.**—(See *Line, Through*.)

**Throwback Indicator, Electrical** — — (See *Indicator, Electric Throwback*.)

**Throwback Indicator, Mechanical** — — (See *Indicator, Mechanical Throwback*.)

**Throw of Needle.**—(See *Needle, Throw of*.)

**Thumb-Cock Electric Burner.**—(See *Burner, Thumb-Cock Electric*.)

**Thunder.**—A loud noise accompanying a lightning discharge.

Thunder is due to the sudden rush of the surrounding air to fill the partially vacuum space accompanying the disruptive discharge of a cloud. This space is caused mainly by the condensation of the vapor formed on the passage of the discharge through drops of rain or moisture in the air, as well as by the expansion of the air itself.

**Thunder Rod.**—(See *Rod, Thunder*.)

**Thunder Storms, Geographical Distribution of** — — (See *Storms, Thunder, Geographical Distribution of*.)

**Tick, Magnetic** — — A faint metallic click heard on the magnetization and demagnetization of a magnetizable substance.

**Ticker Service, Stock** — — The simultaneous transmission of stock quotations or other desired information to a number of subscribers.

The stock ticker-service includes a central transmitting station connected with a given num-

ter of subscribers, each of whom is furnished with a stock ticker. The transmitter at the central station consists of a keyboard and a cylinder furnished with spiral pins. The spiral pins are connected through a series of pole-changers to separate line wires radiating in all directions from the central office.

The connections are such that, a rapid rotation being given by means of an electric motor to the cylinder, the impulses sent out by the keyboard are transmitted to each of the separate circuits. Since each of these circuits has a number of ticker printers connected with it, reports of fluctuations in prices are simultaneously printed in hundreds of different offices.

**Ticker, Stock** — — A form of step-by-step telegraphic instrument employed for automatically sending and recording stock quotations to any desired number of subscribers. (See *Telegraphy, Step-by-Step*.)

A form of printing telegraph.

Callahan's Printing Telegraph is used as a stock ticker. (See *Telegraphy, Printing*.)

Phelps' Stock Printer is employed extensively as a stock ticker. This form of printing telegraph requires but a single wire, and has a working speed of almost thirty words a minute.

A double type wheel, maintained in motion by clockwork, is stopped at the desired characters by the motion of a polarized relay, working between the poles of two electro magnets, furnished with a soft iron or non-polarized armature. The release of the armature of the printing magnet releases a train, and thus insures the impression of the character it is desired to print.

The type-wheel is driven by a step-by-step movement obtained by means of rapidly alternating pulsations. Although these pass through the coils of the printing magnet, they follow one another too rapidly to charge its coils, so that the armature is unaffected until a pause is made, when, its armature being attracted, it releases the printing mechanism. The message is received on a fillet of paper, fed by a suitable mechanism.

**Time-Ball, Electric** — — (See *Ball, Electric Time*.)

**Time-Constant of Circuit** — (See *Circuit, Time-Constant of*.)

**Time-Constant of Condenser** — (See *Condenser, Time-Constant of*.)

**Time-Constant of Electro-Magnet** — (See *Constant, Time, of Electro-Magnet*.)

**Time Cut-Out, Automatic** — — An automatic cut-out arranged on a storage battery so as to cut it in or out of the circuit of the charging source at predetermined times.

**Time-Fall of Electromotive Force of Secondary or Storage Cell During Discharge** — (See *Force, Electromotive, of Secondary or Storage Cell, Time-Fall of*.)

**Time-Lag of Magnetization** — (See *Magnetization, Time-Lag of*.)

**Time, Reaction** — — The time required for the effects of an electric current to pass from a nerve to a muscle.

**Time-Rise of Electromotive Force of Secondary or Storage Cells During Discharge** — (See *Force, Electromotive, of Secondary or Storage Cell, Time-Rise of*.)

**Time-Switch** — (See *Switch, Time*.)

**Time, Telegraphic, Register for Railroads** — — (See *Register, Time, for Railroads*.)

**Time Telegraphy** — (See *Telegraphy, Time*.)

**Tinned Wire** — (See *Wire, Tinned*.)

**Tinning, Electro** — — Covering a surface with a coating of tin by electro-plating. (See *Plating, Electro*.)

Stannic chloride, or the perchloride of tin, dissolved in water in the proportion of 30 parts of the salt to 1,250 of water, makes a good tinning bath.

**Tinnitus, Telephone** — — A professional neurosis, or abnormal nervous condition of the auditory apparatus, believed to be caused by the continual use of the telephone.

**Tip, Polar** — — The free ends of the field magnet pole pieces of a dynamo-electric machine.

**Tissue, Nerve or Muscular Excitability of** — — Electric stimulation of nervous or muscular tissue.

The general effects of electric stimulation of nervous or muscular tissue may be summarized as follows:

(1.) Electric stimulation of a motor nerve, produces a contraction of the muscles to which such nerve is distributed.

(2.) Electric stimulation of a sensory nerve, produces pain in the parts to which the nerve is distributed.

(3.) Electric stimulation of mixed motor and sensory nerves produces both of the effects mentioned under (1) and (2.)

**Tongs, Cable Hanger** — —Tongs provided with long handles for the purpose of attaching the hangers of an aerial cable to the suspending wire or rope.

**Tongs, Discharging** — —A term sometimes used for a discharging rod. (See *Rod, Discharging*.)

**Tongue, Relay, Bias of** — —A term employed to signify such an adjustment of a polarized relay, that on the cessation of the working current, the relay tongue shall always rest against the insulated contact, and not against the other contact, or vice versa.

Sometimes, as in the split-battery duplex, the bias is toward the uninsulated contact. (See *Relay, Polarized*.)

**Tool, Lead Scoring** — —A tool for readily scoring the surface of the lead of a lead-covered cable, when the same is to be removed preparatory to making joints.

**Toothed-Ring Armature**.—(See *Armature, Toothed-Ring*.)

**Top, Induction** — —A top consisting of an iron disc supported on a vertical axis, which, when spun before the poles of a steel magnet, assumes an inclined position, through the influence of the currents induced in the disc.

The top maintains the inclined position so long only as the strength of the induced currents is sufficiently great; that is, while speed of rotation is sufficiently great.

**Töppler-Holtz Machine**.—(See *Machine, Töppler-Holtz*.)

**Torch, Electric Gaslighting** — —A gaslighting appliance consisting of the com-

bination of a portable voltaic battery and a spark or induction coil.

The torch is mounted on the end of a rod provided with means for turning on the gas. A key is then touched and the gas lighted by the spark produced by an induction coil or a small electrostatic induction machine.

**Torpedo, Automobile** — —A torpedo which contains in itself the power for its own motion.

The moving power may be that derived from compressed air or gas, or from a storage battery contained within the torpedo. An automobile torpedo provided with a storage battery and electric motor would then be distinguished from an electrically propelled torpedo, connected by means of cables with a driving dynamo located outside the torpedo on a ship, or on the shore.

**Torpedo Boat**.—(See *Boat, Torpedo*.)

**Torpedo Cable**.—(See *Cable, Torpedo*.)

**Torpedo, Drifting** — —A torpedo suspended from a float, and connected by means of rope with similar torpedoes, allowed to drift with the current, so as to catch against a vessel.

**Torpedo, Electric** — —A name sometimes given to the electric ray. (See *Ray, Electric*.)

**Torpedo, Electric** — —An electrically operated torpedo.

This latter usage of the term is the commoner.

**Torpedo, Halpine-Savage** — —A special form of torpedo, in which electricity is both the propelling and directing power, and in which the electric source furnishing the propelling current is contained within the torpedo.

In the Halpine Savage torpedo, the propelling power is obtained from a storage battery placed within the torpedo.

**Torpedo, Lay** — —A moving torpedo, in which the moving power is carbonic acid gas, or compressed air, or other similar power not electric, and the guiding power is electric.

The Lay torpedo has the form of a cylindrical boat furnished with conical ends. The explosive is placed in the fore part of the torpedo. Flags are

attached to the torpedo, showing the operator the exact course taken by it.

The torpedo is started, stopped and steered by means of electric currents sent to the torpedo through an insulated cable connected with the torpedo.

**Torpedo Nets.**—(See *Nets, Torpedo*.)

**Torpedo, Outtrigger** — —A pole or spar torpedo.

The torpedo is placed in a metallic case and supported on the end of a spar or outtrigger. The spar is depressed until the torpedo is sunk below the water line. The torpedo is fired when its end comes in contact with the side of the enemy's vessel.

**Torpedo, Sims-Edison** — —A special form of torpedo in which electricity is both the propelling and the directing power, but the electric source is situated outside of the torpedo.

The torpedo is propelled by means of an electric motor placed in the torpedo, and driven by means of an electric current transmitted through a cable connected with the sending station.

**Torpedo, Spar** — —A torpedo, attached to the end of a spar, and designed to be exploded by percussion against the side of an enemy's vessel, when thrust against the side below the water-line.

The spar torpedo is but little used, having been replaced by more efficient forms.

**Torpedo, Stationary** — —A term sometimes employed instead of a submarine mine. (See *Mine, Submarine*.)

A stationary torpedo is so named in order to distinguish it from a torpedo which is moved through the water by any means. (See *Torpedo, Towing*.)

**Torpedo, Towing** — —A torpedo arranged to be towed on the surface after a vessel and explode when it strikes the side of an enemy's vessel.

The torpedo is shaped so that it maintains during its motion a certain distance from the sides of the towing boat or vessel.

**Torque.**—That moment of the force applied to a dynamo or other machine which turns it or causes its rotation.

The mechanical rotary or turning force which acts on the armature of a dynamo electric machine or motor and causes it to rotate.

In the case of the armature of a dynamo-electric machine the torque is equal to the radius of the armature, multiplied by the pull at the circumference, or the radius of its pulley multiplied by the pull at the circumference of the pulley.

A torque is exerted on the shaft of a motor from the electro-magnetic action, or pull at the periphery of the armature.

The torque is usually measured in pounds of pull at the end of a radius or arm 1 foot in length.

**Torriceillian Vacuum.**—(See *Vacuum, Torricellian*.)

**Torsion Balance, Coulomb's** — —(See *Balance, Coulomb's Torsion*.)

**Torsion Galvanometer.**—(See *Galvanometer, Torsion*.)

**Total Disconnection.**—(See *Disconnection, Total*.)

**Total Earth.**—(See *Earth, Total*.)

**Total Magnetic Induction.**—(See *Induction, Total Magnetic*.)

**Touch, Double** — —A method of magnetization in which two closely approximated magnet poles are simultaneously drawn from one end of the bar to be magnetized to the other and back again, and this repeated a number of times.

**Touch, Separate** — —A method of magnetization in which two magnetizing poles are simultaneously applied to the bar to be magnetized and drawn over it in opposite directions. (See *Magnetization by Touch*.)

**Touch, Single** — —A method of magnetization in which a single magnetizing bar is drawn from one end to the other of the bar to be magnetized, and returned through the air for the next stroke. (See *Magnetization, Methods of*.)

**Tourmaline.**—A mineral consisting of natural silicates and borates of alumina, lime, iron, etc., possessing pyro-electric properties. (See *Electricity, Pyro*.)



**Tower, Conning** — — A shot-proof tower from which the commander of a turret ship directs the movements of a vessel during action.

**Tower, Electric** — — A high tower provided for the support of a number of electric arc lamps, employed in systems of general illumination.

**Tower System of Electric Lighting.** — The lighting of extended areas by means of arc lights placed on the tops of tall towers.

The tower system of electric illumination is only applicable to wide open spaces, since otherwise objectionable shadows are apt to be formed.

**Towing Torpedo.** — (See *Torpedo, Towing*.)

**Traction, Magnetic** — — The force with which a magnet holds on to or retains its armature, when once attached thereto.

Magnetic traction is to be distinguished from magnetic attraction, or the ability of a magnet pole to draw an armature or other magnets towards it from a distance.

**Train Wire.** — (See *Wire, Train*.)

**Tramway, Electric** — — A railway over which cars are driven by means of electricity.

An electric railroad.

The term tramway is sometimes applied to roads in cities, as distinguished from inter-urban roads.

**Transformer.** — An inverted Ruhmkorff induction coil employed in systems of distribution by means of alternating currents.

A transformer is sometimes called a converter. The word transformer is, however, the one most employed.

A transformer consists essentially of an induction coil, Fig. 556, in which the primary wire is long and thin, and consequently has many turns, as compared with the secondary wire, S, S, which is short, thick, and has few turns.

To prevent heating and loss of energy in conversion, the core of the transformer is thoroughly laminated; to lower the resistance of its magnetic circuit, the transformer is usually iron-clad.

In a system of electrical distribution by means of transformers, alternating currents, of small current strength and comparatively considerable

difference of potential, are sent over a line from a distant station, and passing into the primary wire of a number of converters, generally connected to the line in multiple arc, produce, by induction

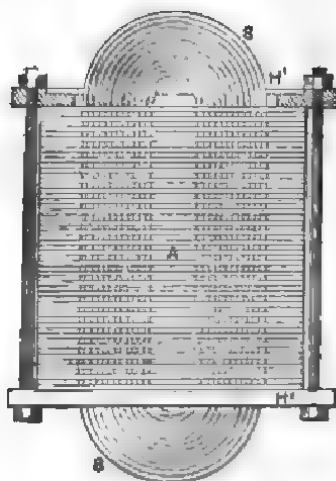


Fig. 556. Transformer.

currents of comparatively great strength and small difference of potential in the secondary wires.

Various electro-receptive devices are connected in multiple arc to circuits connected with the secondary wires.

This method of distribution greatly reduces the cost of the main conducting wires or leads in all cases where the distance is considerable, since considerable energy may be conveniently sent over a comparatively thin wire, with but a trifling loss, if the difference of potential is sufficiently great.

The general arrangement of the converters on the main line, and the connection of the secondary circuits with the electro-receptive devices in

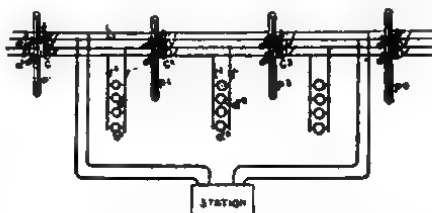


Fig. 557. Transformer Circuits.

such a system, are shown in Fig. 557. The transformers are supported on the line poles, as more

clearly shown in Fig. 558, in which the terminals of the primary and secondary of the converter are readily seen.

When the converter is properly constructed, the loss of conversion at full load is but small; that is to say, the number of watts in the secondary is very nearly equal to the number in the primary. A current of 30 amperes, at 2,000 volts, when passed into a converter the number of whose turns in the primary is twenty times the number in its secondary, will produce in its secondary a current whose strength is about twenty times as great, that is, nearly 600 amperes, but whose voltage is only about one-twentieth, or, 100; the watts in the two cases are nearly the same, or theoretically 20,000 watts.

The ratio between the windings of the primary and the secondary circuits is called the co-efficient of transformation.

In general, the shorter the wire on the secondary, and the smaller its number of turns, the greater is the reduction in the difference of potential, and the greater the current produced. The reduction is nearly proportionate to the ratio of the number of windings of the two coils.

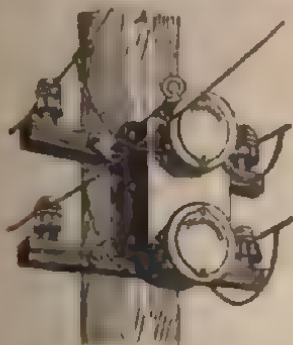


FIG. 558. Transformer Attached to Poles.

#### **Transformer, Closed Iron Circuit —**

—A transformer the core of which forms a complete magnetic circuit.

These transformers are sometimes called iron-rod transformers.

**Transformer, Commutating —** —A term sometimes applied to a variety of motor generator in which neither the armature nor the field magnets revolve, the variations in the polarity of the magnetic circuit being obtained by means of special commutators.

**Transformer, Constant-Current —** —A transformer in which a current of a constant potential in the primary is converted into a current of constant strength in the secondary, despite changes in the load on the secondary.

**Transformer, Core —** —A transformer in which the primary and secondary wires are wrapped around the outside of a core consisting of a bundle of soft iron wires or plates.

A Ruhmkorff coil is a core transformer.

**Transformer, Efficiency of —** —The ratio between the whole energy supplied in any given time to the primary circuit of a transformer and that which appears in the form of electric current in the secondary circuit.

The energy applied to the primary circuit of a transformer is dissipated:

- (1.) By eddy currents in the core of the transformer. (See *Currents, Eddy*.)
- (2.) By hysteresis, or magnetic friction. (See *Hysteresis*.)
- (3.) By heating of the primary circuit.
- (4.) By heating of the secondary circuit.

When a transformer is overloaded, its efficiency decreases. There is a certain range of secondary resistance and current, within which a transformer is most advantageously operated.

**Transformer Guard.** —(See *Guard, Transformer, Lightning*.)

**Transformer, Hedgehog —** —A name applied to a particular form of open-iron circuit transformer. (See *Transformer*.)

The advantages claimed for the hedgehog transformer are that it can be made to give a higher all-day efficiency, since it insures a smaller loss from hysteresis in the iron. The efficiency for very small loads, or for no loads is greater than in the closed-circuit transformer.

**Transformer, Leakage Current of —** —A term sometimes used for the current which escapes from the primary through the dielectric of a transformer to the secondary circuit.

The term is a bad one, since the true leakage current would be the current which represents the leakage between the primary or secondary circuit and the ground.

**Transformer Lightning Arrester.**—(See *Arrester, Lightning, Transformer*.)

**Transformer, Multiple** — — Any form of transformer which is connected in multiple to the primary circuit.

A multiple or parallel transformer is self-regulating under variable loads, provided the electromotive force in the primary is maintained constant.

**Transformer, Oil** — — A transformer which is immersed in oil in order to insure a high insulation.

**Transformer, Open-Iron Circuit** — — A transformer the iron of which does not form a complete magnetic circuit, but is formed instead partly of iron and partly of air.

**Transformer, Pilot** — — A small transformer, placed at any desired portions of a line in order to determine the drop of potential.

The pilot transformer is used in connection with a lamp or other suitable indicating device. Its use is similar to the use of the pilot incandescent lamp.

**Transformer, Rotary-Current** — — A transformer operated by means of a rotary current. (See *Current, Rotating*.)

The rotary current transformer for a rotary current of three separate alternating currents combined, transforms all three currents together. There are three cores, connected at one set of ends and at the other to the circumference of an iron ring. Each core contains a primary and secondary wire.

**Transformer, Rotary-Phase** — — A rotary current transformer. (See *Transformer, Rotary-Current*.)

**Transformer, Series** — — Transformers which are connected in series with the primary circuit.

A series transformer is not as readily made self-regulating under variations in the load as a multiple transformer. If, however, its core is not saturated, and the electromotive force of its secondary is small, it can be made fairly self-regulating. Series transformers are used in the Jablochhoff system for feeding arc lamps in the shape of Jablochhoff candles.

**Transformer, Shell** — — A transformer

in which the primary and secondary coils are laid on each other, and the iron core is then wound through and over them so as to enclose all the copper of the primary and secondary circuits within the iron.

The iron shell surrounding the copper may consist of the thin plates of iron, built up so as to leave a rectangular space for the introduction of the primary and secondary.

**Transformer, Step-Down** — — A transformer in which a small current of comparatively great difference of potential is converted into a large current of comparatively small difference of potential.

An inverted Ruhmkorff induction coil.

**Transformer, Step-Up** — — A transformer in which a large current of comparatively small difference of potential is converted into a small current of comparatively great difference of potential.

The term step-up transformer is used in contradistinction to the step down transformer.

The old form of Ruhmkorff coil is an example of a step-up transformer.

**Transformer, Testing** — — A transformer employed in any system of distribution for the purposes of testing for grounds, condition of line, drop of potential, etc.

**Transformer, Welding** — — A transformer suitable for changing a small electric current of comparatively high difference of potential, into the heavy currents of low difference of potential required for welding purposes.

Welding transformers have in general a very low resistance in their secondary coils, and almost invariably consist of a single turn or at the most of a few turns of very stout wire.

**Transforming Currents.**—(See *Current, Transforming a*.)

**Transforming Down.**—Transforming by means of a step-down transformer. (See *Transformer, Step-Down*.)

**Transforming Station.**—(See *Station, Transforming*.)

**Transforming Up.**—Transforming by means of a step-up transformer. (See *Transformer, Step-Up*.)

**Transient Currents.**—(See *Currents, Transient*.)

**Transit, Magnetic Variation** — —An apparatus for measuring the declination or variation of the magnetic needle at any place.

The variation transit generally consists of an altitude and azimuth instrument, the telescope of which is so arranged as to be readily converted into a microscope.

**Transition Resistance.**—(See *Resistance, Transition*.)

**Translator, Double-Current** — —A telegraphic translator or repeater designed to operate on double current transmission.

**Translator, Single-Current** — —A telegraphic translator or repeater designed to operate a single-current transmission.

**Translator, Telegraphic** — —A term sometimes applied to a telegraphic repeater. (See *Repeaters, Telegraphic*.)

**Translating Device.**—(See *Device, Translating*.)

**Translating Devices, Multiple-Arc-Connected** — —(See *Devices, Translating, Multiple-Arc-Connected*.)

**Translating Devices, Multiple-Connected** — —(See *Devices, Translating, Multiple-Connected*.)

**Translating Devices, Multiple-Series-Connected** — —(See *Devices, Translating, Multiple-Series-Connected*.)

**Translating Devices, Series-Connected** — —(See *Devices, Translating, Series-Connected*.)

**Translating Devices, Series-Multiple-Connected** — —(See *Devices, Translating, Series-Multiple-Connected*.)

**Translucent-Disc Photometer.** — (See *Photometer, Translucent-Disc*.)

**Transmission, Double** — —The simultaneous sending of two messages over a single wire in opposite directions. (See *Telegraphy, Duplex, Bridge Method of*.)

**Transmission, Multiple** — —The simultaneous sending of more than two messages over a single line or conductor.

**Transmission of Energy.**—(See *Energy, Electric, Transmission of*.)

**Transmitter, Carbon, for Telephones** — —A telephone transmitter consisting of a button of compressible carbon.

The sound waves impart to-and-fro movements to the transmitting diaphragm, and this to the carbon button, thus varying its resistance by pressure. This button is placed in circuit with the battery and induction coil. (See *Telephone*.)

**Transmitter, Double-Current** — —The transmitting instrument employed in systems of telegraphy, by means of which the direction of the currents on the line is alternately changed, according to whether the key rests on its front or on its back stop.

Double-current transmitters are used in connection with instruments, such as polarized relays, which respond to change in the direction of the current, rather than to changes in its intensity.

**Transmitter, Electric** — —A name applied to various electric apparatus employed in telegraphy or telephony to transmit or send the electric impulses over a line wire or conductor.

The sending instrument as distinguished from the receiving instrument.

In most telegraphic systems, the transmitting instrument consists of various forms of keys for interrupting or varying the current. In the telephone the transmitter consists of a diaphragm operated by the voice of the speaker. (See *Telephone*.)

**Transmitter, Water-Jet Telephone** — —A telephone transmitter consisting of a jet of water issuing vertically downwards from a small orifice.

The jet forms a part of the circuit of the receiving telephone. In order to reduce its resistance, the water is rendered acid by the addition of sulphuric acid, and a battery of high electromotive force is employed. Since the jet has a high resistance, a battery of high resistance can be used without inconvenience.



**Transposing.**—In a system of telephonic communication a device for avoiding the bad effects of induction by alternately crossing equal lengths of consecutive sections of the line. (See *Connection, Telephonic Cross.*)

**Transverse Electromotive Force.**—(See *Force, Electromotive, Transverse.*)

**Treatment, Hydro-Carbon, of Carbons** — — Exposing carbons, while electrically heated to incandescence, to the action of a carbonizing gas, vapor or liquid, for the purpose of rendering them more uniformly electrically conducting throughout. (See *Carbons, Flashing Process for.*)

**Tree, Parallel, Circuit** — — (See *Circuit, Parallel-Tree.*)

**Trembling Bell.**—(See *Bell, Trembling.*)

**Trigonometrical.**—Of or pertaining to trigonometry. (See *Trigonometry.*)

**Trigonometrical Function.**—(See *Function, Trigonometrical.*)

**Trigonometrically.**—In a trigonometrical manner.

**Trigonometry.**—That branch of mathematical science which treats of the methods of determining the values of the angles and sides of a triangle.

There are in every triangle three sides and three angles. If any three of these parts are given, except the three angles, the values of the remaining parts can be determined by means of

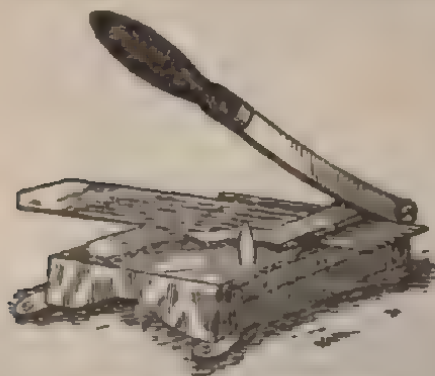


Fig. 550. Dynamo Brush Trimmer.

trigonometry, by what is called the solution of the triangle. (See *Function, Trigonometrical.*)

**Trimmer.**—An employee of an electric light company who renews the carbons in arc lamps.

**Trimmer, Dynamo Brush** — — A device for insuring rapid and accurate trimming of dynamo brushes.

The brush trimmer consists of a knife, placed as shown in Fig. 559 on a rigid support. The brushes are placed under a clamp, and against a straight edge, so that a single cut with the knife blade insures a clean and true cut.

**Trimming.**—A term sometimes applied to the act of placing the carbons in an electric arc lamp.

The phrase, carboning a lamp, would appear to be preferable to trimming a lamp.

**Triple-Carbon Arc Lamp.**—(See *Lamp, Arc, Triple-Carbon.*)

**Tripod Roof Support.**—(See *Support, Tripod Roof.*)

**Trolley.**—A rolling contact wheel that moves over the overhead lines provided for a line of electric railway cars, and carries off the current required to drive the motor car.

**Trolley Crossing.**—A device placed at the crossing of two trolley wires, by which the trolley wheel running on one wire may cross the other.

Such a device can also be made to hold the two wires together.

**Trolley Crossing, Insulated** — — A device used at the crossing of two trolley wires, which insulates the wires from each other, but which permits the trolley wheel of one line to cross the other trolley line.

**Trolley Cross-Over.**—(See *Cross-Over, Trolley.*)

**Trolley, Double** — — The traveling conductors, which move over the lines of wire in any system of electric railways that employs two overhead conductors.

In one form of double trolley a bar of wood carries two hangers, separated from each other, and furnished with diverging feet, with clips that embrace the two conducting wires. These wires serve also as the track for the two-wheeled trolley. The trolley consists of two plates connected to and insulated from each other under the conductors,

and carrying flanged wheels, extending in over the conductors.

Swinging from the axes of the poles are arms, which form a bail-like draft loop, with insulated material between their lower ends, and furnish means for connection with the car motor. In order to remove this trolley from the conducting wires, these arms are pressed together at points between two points of hangers, which allows them to pass between the inner ends of the wheel axes.

The trolley cannot be removed from the wires except at the end of the track, and it is therefore found in practice to be particularly useful in mines, where, from the nature of the galleries, the trolley wheel is very apt to become detached from the trolley wires.

**Trolley, Drop** — The trolley wheel and rod for an electric car which drops away from the wire on slipping from the wire, and is reset upwards through proper elastic pressure.

**Trolley Fork.**—(See *Fork, Trolley*.)

**Trolley Frog.**—(See *Frog, Trolley*.)

**Trolley Frog, Standard** — (See *Frog, Trolley, Standard*.)

**Trolley Hanger.**—(See *Hanger, Trolley*.)

**Trolley Pole.**—(See *Pole, Trolley*.)

**Trolley Section.**—(See *Section, Trolley*.)

**Trolley, Single** — A traveling conductor or wheel which moves over a single conductor in a system of electric railways, and takes off the current for driving the electric motor, in connection with an earth or grounded return conductor.

**Trolley Wheel.**—(See *Wheel, Trolley*.)

**Trolley, Wire** — (See *Wire, Trolley*.)

**True Contact Force.**—(See *Force, True Contact*.)

**True Resistance.** — (See *Resistance, True*.)

**Trumpet, Electric** — An electromagnetic buzzer, the sound of which is strengthened by means of a resonator in the shape of a trumpet. (See *Buzzer, Electric, Resonator, Electric*.)

The electric trumpet is used to replace electric bells. It gives a louder and more penetrating sound than the electric bell.

**Trunking Switch Board.**—(See *Board, Switch, Trunking*.)

**Tube, Crookes'** — A tube containing a high vacuum and adapted for showing any of the phenomena of the ultra-gaseous state of matter. (See *Matter, Radiant, or Ultra-Gaseous*.)

**Tube, Insulating** — A tube of insulating material provided for covering a splice in an insulated conductor.

**Tube, Mercury** — Vacuum glass tubes in which a flash of light is produced by the fall of a small quantity of mercury placed inside it.

The light is caused by the electricity produced by the friction of the mercury in falling against the sides of a spiral glass tube placed inside the vacuum tube.

**Tube, Plücker** — A modification of a Geissler tube adapted for the study of the stratification of the light, and the peculiarities of the space adjoining the negative electrode. (See *Tubes, Geissler*.)

**Tube, Spark** — A high vacuum tube, across which, when the vacuum is sufficiently high, the spark from an induction coil will not pass.

A spark tube, connected with incandescent lamps while undergoing exhaustion, acts as a simple gauge to determine the degree of exhaustion. When an induction coil discharge ceases either to pass, or to pass freely, the vacuum is considered as sufficient, according to circumstances.

**Tube, Stratification** — An exhausted glass tube, the residual atmosphere of which displays alternate dark and light striz, or stratifications, on the passage through it of an induction coil discharge. (See *Discharge, Luminous Effects of*.)

**Tubes, Geissler** — Vacuum tubes of glass containing various gases, liquids or solids, provided with platinum electrodes, passed through and fused into the glass, designed to show the various luminous effects

of electric discharges through gases at comparatively low pressures.

Geissler tubes are made of a great variety of shapes, and often include tubes, spirals, spheres, etc., within other tubes. These enclosed tubes are made either of ordinary glass, or of uranium glass in order to obtain the effects of fluorescence.

The vacuum in Geissler tubes is by no means what might be called a high vacuum. Indeed, if the exhaustion of the tube be pushed too far, much of the brilliancy of the luminous effects is lost.

Some of the many forms of Geissler tubes are shown in Fig. 560.



Fig. 560. Geissler Tubes

**Tubes of Force.**—(See *Force, Tubes of*.)

**Tubes of Induction.**—(See *Induction, Tubes of*.)

**Tubes, Vacuum** — — Glass tubes, from which the air has been partially exhausted and through which electric discharges are passed for the production of luminous effects. (See *Tubes, Geissler*.)

**Tubular Braid.**—(See *Braid, Tubular*.)

**Tumbling Box.**—(See *Box, Tumbling*.)

**Tuning-Fork or Reed Interrupter.**—(See *Interrupter, Tuning-Fork, Interrupter, Reed*.)

**Turn, Ampère** — — A single turn or winding in a coil of wire through which one ampère passes.

An ampère-turn is sometimes called an ampère-winding. Magneto-motive force in a magnetic circuit is proportioned to the number of ampère-turns linked with it. The practical unit of magneto-motive force is  $\frac{1}{4\pi} \times \text{ampère turn} = .0796$  ampère turn. Therefore the magneto-motive

force, m. m. f., is found by multiplying the ampère turns by  $4\pi$  or 12.57.

The number of ampères multiplied by the number of windings or turns of wire in a coil give the total number of ampère-turns in the coil.

In a coil of fixed dimensions the magnetizing force developed by a given number of ampère-turns remains the same as long as the product of the ampères and the current remains the same. That is to say, the same amount of magnetizing force can be obtained by the use of many windings and a small current, as in shunt dynamos, or by a few turns and a proportionally large current, as in series dynamos. (See *Machine, Dynamo-Electric*.)

**Turns, Ampère, Primary** — — The ampère-turns of the primary of an induction coil.

**Turns, Ampère, Secondary** — — The ampère-turns of the secondary of an induction coil.

**Turns, Dead** — — The number of revolutions a self-exciting dynamo makes before it excites itself.

**Turns, Dead, of Armature Wire** — — Those turns of the wire on the armature of a dynamo-electric machine which produce no useful electromotive force or resultant current, on the movement of the armature through the magnetic field of the machine.

The wire on the inside of a Gramme or ring armature is dead wire, but not dead turns.

**Turns, Series, of Dynamo-Electric Machines** — — The ampère-turns in the series circuit of a compound-wound dynamo-electric machine. (See *Machine, Dynamo-Electric, Compound-Wound*.)

**Turns, Shunt, of Dynamo-Electric Machine** — — The ampère-turns in the shunt circuit of a compound-wound dynamo-electric machine. (See *Machine, Dynamo-Electric, Compound-Wound*.)

**Turn-Table, Electric** — — A table, suitable for show windows, revolved around a vertical axis by means of an electric motor.

**Twig.** — A sub-branch. (See *Branca, Sub*.)

**Twin Wire.**—(See *Wire, Twin*.)

**Twist in Leads.**—(See *Leads, Armature, Twist in.*)

**Twisted Bunched Cable.**—(See *Cable, Bunched, Twisted.*)

**Twisted-Pair Cable.**—(See *Cable, Twisted-Pair.*)

**Twisting Force.**—(See *Force, Twisting.*)

**Two-Fluid Voltaic Cell.**—(See *Cell, Voltaic, Two-Fluid.*)

**Two-Point Switch.**—(See *Switch, Two-Point.*)

**Two, Three, Four, etc., Conductor Cable** — (See *Cable, Two, Three, Four, etc., Conductor.*)

**Two-Way Splice Box.**—(See *Box, Splice, Two-Way.*)

**Two-Way Switch.**—(See *Switch, Two-Way.*)

**Type-Printing Telegraph.**—(See *Telegraphy, Printing.*)

**Typewriter, Electric** — —A typewriting machine, in which the keys are intended to make the contacts only of circuits of electro-magnets, by the attraction of the armatures of which the movements of the type levers required for the work of printing are effected.

Electric typewriters secure a uniformity of impression that is impossible to obtain with hand worked machines. They also greatly lessen the mechanical labor of writing. (See *Dynamograph.*)

## U

**U.**—A contraction sometimes used for unit.

**Ultra-Gaseous Matter.**—(See *Matter, Radiant, or Ultra-Gaseous.*)

**Underground Cable.**—(See *Cable, Underground.*)

**Underground Conductor.**—(See *Conductor, Underground.*)

**Undulating Currents.**—(See *Current, Undulating.*)

**Undulatory Currents.**—(See *Currents, Undulatory.*)

**Undulatory Discharge.**—(See *Discharge, Undulatory.*)

**Ungilding Bath.**—(See *Bath, Ungilding.*)

**Unidirectional Discharge.**—(See *Discharge, Unidirectional.*)

**Unidirectional Leak.**—(See *Leak, Unidirectional.*)

**Uniform Density of Field.**—(See *Field, Uniform Density of.*)

**Uniform Magnetic Field.**—(See *Field, Magnetic, Uniform.*)

**Uniform Magnetic Filament.**—(See *Filament, Uniform Magnetic.*)

**Uniform Potential.**—(See *Potential, Uniform.*)

**Uniformly Distributed Current.**—(See *Current, Uniformly Distributed.*)

**Unipolar Armature.**—(See *Armature, Unipolar.*)

**Unipolar Electric Bath.**—(See *Bath, Unipolar-Electric.*)

**Unipolar Induction.**—(See *Induction, Unipolar.*)

**Unit Angle.**—(See *Angle, Unit, Velocity, Angular.*)

**Unit Angular Velocity.**—(See *Velocity, Angular.*)

**Unit, B. A.** — —A term formerly applied to the British Association unit of resistance, or ohm. (See *Ohm.*)

**Unit-Difference of Potential or Electromotive Force** — —(See *Potential, Unit Difference of.*)

**Unit, Magnetic, A** — —A term sometimes used for a line of magnetic force, or the amount of magnetism induced in an area of one square centimetre at the centre of a coil having a diameter of 10 centimetres and carrying a current of 7.9578 ampères.

**Unit, Natural, of Electricity** — —(See *Electricity, Natural Unit of.*)

**Unit of Acceleration.**—(See *Acceleration, Unit of*.)

**Unit of Activity.**—(See *Activity, Unit of*.)

**Unit of Current, Absolute** — (See *Current, Absolute Unit of*.)

**Unit of Current, Jacobi's** — (See *Current, Jacobi's Unit of*.)

**Unit of Electrical Supply.**—(See *Supply, Unit of, Electrical*.)

**Unit of Electromotive Force, Absolute** — (See *Force, Electromotive, Absolute Unit of*.)

**Unit of Electrostatic Capacity.**—(See *Capacity, Electrostatic, Unit of*.)

**Unit of Heat.**—(See *Heat Unit*.)

**Unit of Inductance.**—(See *Inductance, Unit of*.)

**Unit of Mass.**—(See *Mass, Unit of*.)

**Unit of Photometric Intensity.**—(See *Intensity, Photometric, Unit of*.)

**Unit of Power.**—(See *Power, Unit of*.)

**Unit of Pressure, New** — (The Barad. (See *Barad*.)

**Unit of Resistance.**—(See *Resistance, Unit of*.)

**Unit of Resistance, Absolute** — (See *Resistance, Absolute Unit of*.)

**Unit of Resistance, Jacobi's** — (See *Resistance, Unit of, Jacobi's*.)

**Unit of Resistance, Matthiessen's** — (See *Resistance, Unit of, Matthiessen's*.)

**Unit of Resistance, Varley's** — (See *Resistance, Unit of, Varley's*.)

**Unit of Velocity, New** — (See *Velocity, New Unit of*.)

**Unit Quantity of Electricity.**—(See *Electricity, Unit Quantity of*.)

**Unit-Strength of Current.**—(See *Current, Unit Strength of*.)

**Units, Absolute** — A system of units based on the centimetre for the unit of length, the gramme for the unit of mass, and the second for the unit of time.

These units are more frequently called the centimetre-gramme-second units.

**Units, Centimetre-Gramme-Second** — A system of units in which the centimetre is adopted for the unit of length, the gramme for the unit of mass, and the second for unit of time.

This is the same as the absolute system of units.

**Units, C. G. S.** — The centimetre-gramme-second units. (See *Units, Fundamental*.)

**Units, Circular** — Units based upon the value of the area of a circle whose diameter is unity.

The advantages possessed by the circular units of cross-section arise from the fact that in these units the areas are equal to the squares of the diameter. No necessity exists, therefore, for multiplying by .7854.

**Units, Circular (Cross-Sections), Table of** —

1 circular mil	..... = .78540 square mil.
" "	..... = .00064514 circular millimetre.
" "	..... = .00050669 square millimetre.
1 square mil	..... = 1.2732 circular mils.
" "	..... = .00082141 circular millimetre.
1 circular millimetre	..... = 1550.1 circular mils.
" "	..... = 1217.4 square mils.
" "	..... = .78540 square millimetre.
1 square millimetre	..... = 1973.6 circular mils.
" "	..... = 1.2732 circular millimetres.

If  $d$ , is the diameter of a circle, the area in other units is:

If  $d$ , is in mils, the area in square millimetres. ... =  $d^2 \times .00050669$ .  
 $d$ , in millimetres, area in square mils. .... =  $d^2 \times 1217.4$ .  
 $d$ , in centimetres, area in square inches. .... =  $d^2 \times 13174$ .  
 $d$ , in inches, area in square centimetres. .... =  $d^2 \times 5.0669$ .

—(Hering.)



**Units, Derived** — — Various units obtained or derived from the fundamental units of Length,  $L$ , Mass,  $M$ , and Time,  $T$ .

The derived units and their dimensions are as follows:

*Area*,  $L^2$ .—The square centimetre.

*Volume*,  $L^3$ .—The cubic centimetre.

*Velocity*,  $V$ .—Unit distance traversed in unit time, or

$$V = \frac{L}{T} \quad (1)$$

*Acceleration*,  $A$ .—The rate of change which will produce a change of velocity of one centimetre per second.

$$A = \frac{V}{T} \quad (2)$$

Substituting in equation (2) the value of  $V$ , in equation (1), we have

$$A = \frac{\frac{L}{T}}{T} = \frac{L}{T^2} \quad (3)$$

*Force*,  $F$ .—The *dyne*, or the force required to set in unit mass in order to impart to it unit velocity

$$F = M \times A. \quad (4)$$

Substituting the value of  $A$ , derived from equation (2), we have

$$F = M \times \frac{V}{T}$$

Substituting the value of  $V$ , derived from equation (1), we have

$$F = \frac{M}{T} \times \frac{L}{T} = \frac{ML}{T^2} \quad (5)$$

*Work or Energy*,  $W$ .—The *erg*, or the work done in overcoming unit force through unit distance

$$W = F \times L = \frac{ML}{T^2} \times L = \frac{ML^2}{T^2}$$

*Power*,  $P$ .—The unit rate of doing work.

$$P = \frac{W}{T} = \frac{\frac{ML^2}{T^2}}{T} = \frac{ML^2}{T^3} \quad (6)$$

**Units, Dimensions of** — — The values given to the units of length,  $L$ ; mass,  $M$ , and time,  $T$ . (See *Units, Derived*.)

**Units, Electro-Magnetic** — — A system of units derived from the C. G. S. units, employed in electro-magnetic measurements.

(See *Units, Centimetre-gramme-Second*.)

Units based on the attractions or repulsions between two unit magnetic poles at unit distance apart. (See *Units, Electrostatic*.)

#### Units, Electro-Magnetic, Dimensions of

$$\text{Current Strength} = \frac{\text{Intensity of Field} \times \text{Length}}{\sqrt{\frac{ML}{T}}} = \frac{\sqrt{ML}}{T}$$

$$\text{Quantity} = \text{Current} \times \text{Time} = \sqrt{M \times L} \cdot T$$

Potential, Difference of Potential, Electromotive Force =

$$\frac{\text{Work}}{\text{Quantity}} = \frac{\sqrt{M \times L}}{T}$$

$$\text{Resistance} = \frac{\text{Electromotive Force}}{\text{Current}} = \frac{L}{T}$$

$$\text{Capacity} = \frac{\text{Quantity}}{\text{Potential}} = \frac{T^2}{L}$$

**Units, Electrostatic** — — Units based on the attractions or repulsions of two unit charges of electricity at unit distance apart.

Two systems of electric units are derived from the C. G. S. system, viz., the *electrostatic* and *electro-magnetic*. These units are based respectively on the force exerted between two quantities of electricity and between two magnetic poles.

The electrostatic units embrace the units of *quantity*, *potential* and *capacity*. No particular names have as yet been adopted for these units.

*Unit of Quantity*.—That quantity of electricity which will repel an equal quantity of the same kind of electricity placed at a distance of one centimetre from it with the force of one dyne.

Electrostatic potential, or power of doing electrostatic work, is measured in units of work, or ergs.

*Unit Difference of Potential*.—Such a difference of potential between two points as requires the expenditure of one *erg* of work to bring up a unit of positive electricity from one point to the other against the electric force.

*Unit of Capacity*.—Such a capacity of conductor as will take a charge of one unit of electricity when the potential is unity.

The ratio between the inductive capacity of a substance and that of air, measured under pre-

cisely similar conditions, is called the *specific inductive capacity*.

The specific inductive capacity is obtained by comparing the capacity of a condenser filled with the particular substance and the capacity of the same condenser when filled with air. The specific inductive capacity of air is taken as unity.

### Units, Electrostatic, Dimensions of

$$\text{Quantity} = \sqrt{\text{Force} \times (\text{Distance})^3} = \sqrt{F \times L^3} =$$

$$\frac{M^{\frac{1}{2}} L^{\frac{3}{2}}}{T} = \frac{\sqrt{M \times L^3}}{T}.$$

$$\text{Current} = \frac{\text{Quantity}}{\text{Time}} = \frac{M^{\frac{1}{2}} L^{\frac{3}{2}}}{T^2} = \frac{\sqrt{M \times L^3}}{T^2}.$$

$$\text{Potential} = \frac{\text{Work}}{\text{Quantity}} = \frac{M^{\frac{1}{2}} L^{\frac{3}{2}}}{T} = \frac{\sqrt{M \times L^3}}{T}.$$

$$\text{Resistance} = \frac{\text{Potential}}{\text{Current}} = L^{-1} T = \frac{T}{L}.$$

$$\text{Capacity} = \frac{\text{Quantity}}{\text{Potential}} = L.$$

Specific Inductive Capacity =

$$\frac{\text{One Quantity}}{\text{Another Quantity}} = \text{A Simple Ratio or Number.}$$

Electromotive Intensity =

$$\frac{\text{Force}}{\text{Quantity}} = M^{\frac{1}{2}} L^{\frac{3}{2}} T^{-1} = \frac{\sqrt{M \times L^3}}{T}.$$

The fractional and negative exponents used above are merely convenient methods of expressing the extraction of roots and division respectively by the quantity represented by these exponents.

**Units, Fundamental** — — The units of length, time and mass, to which all other quantities can be referred.

The unit of length is now generally taken as the *centimetre*, the unit of time as the *second*, and the unit of mass as the *gramme*. These form a system of measurement known as the *centimetre-gramme-second* system, or the C. G. S. system, or absolute system. (See *Units, Derived*.)

The dimensions of the fundamental units are designated thus:

$$\text{Length} = L.$$

$$\text{Mass} = M.$$

$$\text{Time} = T.$$

**Units, Heat** — — Units based on the

quantity of heat required to raise a given weight or quantity of a substance, generally water, one degree.

The principal heat units are the English heat unit, the greater and smaller calorie and the joule. (See *Calorie, Joule*.)

The following table gives the values of some of the principal heat units:

1 gram. centigrade,	.001	kilogram centigrade.
1 pound Fahrenheit,	1,047.03	joules.
"	772.	foot-pounds.
"	106.731	kilogram metres.
"	.55556	pound centigrade.
"	.25200	kilogram centigrade.
"	.39084	watt-hours.
"	.0003953	metric horse-power.
"	.0003899	horse-power hours.
1 pound centigrade,	1,884.66	joules.
"	1,389.6	foot-pounds.
"	198.116	kilogram metres.
"	1.800	pound Fahrenheit.
"	.4536	kilogram centigrade.
"	.52352	watt hour.
"	.0007115	metric horse-power hour.
"	.0007018	horse power hour.
1 kilogram centigrade,	4,184.95	joules.
"	3,063.5	foot-pounds.
"	473.54	kilogram metres.
"	3.9683	pound Fahrenheit.
"	2.2046	pound centigrade.
"	1.1542	watt-hour.
"	.001569	metric horse-power hour.
"	.0015472	horse-power hour.

—Hering.

**Units, Magnetic** — — Units based on the force exerted between two magnet poles.

Unit strength of a magnetic pole is such a magnetic strength of pole that repels another magnetic pole of equal strength placed at unit distance with unit force, or with the force of one dyne.

*Magnetic Potential*.—Is the power of doing work possessed by a magnetic pole.

Magnetic potential is measured like electrostatic potential in units of work or in ergs.

*Magnetic Potential, Unit Difference of*.—Such a difference of magnetic potential between two points that requires the expenditure of one erg of work to bring a magnetic pole of unit strength from one to the other.

*Unit Intensity of Magnetic Field*.—Such an intensity of magnetic field as acts on a north or south-seeking pole of unit strength with the force of one dyne.



**Units, Magnetic, Dimensions of — —**

Strength of Pole, or }  
Quantity of Magnetism }  
=  $\sqrt{\text{Force} \times (\text{Distance})^3} = \sqrt{\frac{ML^3}{T}}$

Magnetic Potential  
=  $\frac{\text{Work}}{\text{Strength of Pole}} = \sqrt{\frac{M \times L}{T}}$

Intensity of Field =  $\frac{\text{Force}}{\text{Strength of Pole}} = \frac{\sqrt{M}}{T \times \sqrt{L}}$

**Units, Practical — —** Multiples or fractions of the absolute or centimetre-gramme-second units.

The practical units have been introduced because the absolute units are either too small or too large for actual use.

*Electromotive Force.*—The *Volt* = 100,000,000 C. G. S. or absolute units, that is,  $10^8$  absolute units of resistance. (See *Volt*.)

*Resistance.*—The *Ohm* = 1,000,000,000 absolute units of electromotive force, or  $10^9$  absolute units. (See *Ohm*.)

*Current.*—The *Ampère* =  $\frac{1}{10}$  absolute unit of current. (See *Ampère*.)

*Quantity.*—The *Coulomb* =  $\frac{1}{10}$  absolute unit of quantity, of the electro-magnetic system. (See *Coulomb*.)

*Capacity.*—The *Farad* =  $\frac{1}{1,000,000,000}$  absolute unit of capacity, or  $10^9$  units of capacity. (See *Farad*, *Henry*, *Watt*, *Joule*.)

**Units, Proposed New — —** The following units and terms have recently been proposed by Oliver Heaviside.

Some of these have been generally adopted.

*Conductance.*—Capacity for conducting electricity

Numerically, the ratio, in absolute measure, of the current strength to the total electromotive force in a circuit of uniform flow. A quantity with the nature of a slowness or reciprocal to a velocity. The practical unit is called the mho.

*Permeability.*—Conductance per unit volume.

*Permittance.*—Capacity of a dielectric for opposing electric charge or displacement.

Numerically, the ratio, in absolute measure, of the difference of potential in an electrostatic circuit to the total charge or displacement therein produced. The reciprocal of permittance and a quantity of the inverse nature of a length."

*Elastivity.*—Elastance per unit volume of dielectric."

*Impedance.*—Capacity for opposing the variable flow of electricity.

"Numerically, in the absolute measure, the ratio of the total electromotive force to the current strength at any instant in a circuit of a variable flow. A quantity with the nature of a velocity and in any circuit always greater than the resistance."

*Inductance.*—Capacity for magnetic induction."

"Numerically, in absolute measure, the number of unit lines of magnetic force linked with a circuit traversed by the unit current strength. Sometimes alluded to as the co-efficient of self-induction. A quantity of the nature of a length."

*Inductivity.*—Specific capacity for magnetic induction.

"The numerical ratio of the induction in a medium to the induction producing it."

*Permittance.*—Electrostatic capacity. Capacity of a dielectric for assisting charge or displacement.

"Numerically, the ratio, in absolute measure, of the total charge or displacement in the electrostatic circuit, to the difference of potential producing it. A quantity with the nature of a length."

*Permittivity.*—The numerical ratio of the permittance of a dielectric to that of air.

"Also known as specific inductive capacity."

*Reluctance.*—Capacity for opposing magnetic induction.

"Numerically, the ratio, in absolute measure, of the magneto-motive force in a magnetic circuit to the total induction therein produced. A quantity with the nature of the reciprocal of a length. Sometimes described as magnetic resistance."

*Reluctancy or Reluctivity.*—Reluctance per unit volume.

"Sometimes described as specific magnetic resistance. A numeric, the reciprocal of inductivity."

*Resistance.*—Capacity for opposing the steady flow of electricity.

"Numerically, in absolute measure, the ratio of the total electromotive force to the current strength in a circuit of uniform flow. A quantity with the nature of a velocity. The practical unit is called the ohm."

*Relativity.*—Resistance per unit volume; sometimes alluded to as specific resistance."

**Universal Discharger.**—(See *Discharger*, *Universal*.)

**Upright Galvanometer.**—(See *Galvanometer*, *Upright*.)

## V

**V.**—A contraction sometimes used for volt.

**V.**—A contraction sometimes used for velocity.

**V.**—A contraction sometimes used for volume.

**V. A.**—A contraction sometimes used for voltaic alternative. (See *Alternatives, Voltaic.*)

**Vacuum, Absolute** — — A space from which all traces of residual gas have been removed.

A term sometimes loosely applied to a partial vacuum.

It is doubtful whether an absolute vacuum is attainable by any physical means.

**Vacuum, High** — — A space from which nearly all traces of air or residual gas have been removed.

Such a vacuum that the length of the mean free path of the molecules of the residual atmosphere is equal to or exceeds the dimensions of the containing vessel. (See *Layer, Crookes'.*)

**Vacuum, Low** — — Such a vacuum that the mean free path of the molecules of the residual gas is small as compared with the dimensions of the containing vessel. (See *Tubes, Geissler.*)

In a high vacuum groups of molecules can move across the containing vessel without meeting other groups of molecules. In a low vacuum such a group of molecules would be broken up by collision against other groups before reaching the other side of the vessel.

**Vacuum, Partial** — — A name sometimes applied to a low vacuum. (See *Vacuum, Low.*)

**Vacuum, Torricellian** — — The vacuum which exists above the surface of the mercury in a barometer tube or other vessel over thirty inches in vertical height.

The Torricellian vacuum is high only when the mercury has been carefully boiled and the tube or other vessel vigorously heated, so as to thor-

oughly drive out the moisture and adherent film of air.

**Vacuum Tubes.**—(See *Tubes, Vacuum.*)

**Valency.**—The worth or value of a chemical atom as regards its power of displacing other atoms in chemical compounds. (See *Atomicity.*)

The worth or valency of an atom of oxygen is twice as great as that of hydrogen, since one atom of oxygen is able to replace two hydrogen atoms in chemical combinations.

**Valve, Electric** — — An electrically controlled or operated valve.

In systems of electro-pneumatic signals, gaseous or liquid pressure controlled by electrically operated valves is employed to move signals, ring bells, control water and air valves, or to perform other similar work.

**Vapor Globe of Incandescent Lamp.**— (See *Globe, Vapor, of Incandescent Lamp.*)

**Variable Inductance.**—(See *Inductance, Variable.*)

**Variable Period of Electric Current.**— (See *Current, Variable Period of.*)

**Variable Resistance.**—(See *Resistance, Variable.*)

**Variable Resistance, Automatic** — — (See *Resistance, Variable, Automatic.*)

**Variable Resistance, Non-Automatic** — — (See *Resistance, Variable, Non-Automatic.*)

**Variable State of Charge of Telegraph Line.**—(See *State, Variable, of Charge of Telegraph Line.*)

**Variation, Angle of** — — The angle which measures the deviation of the magnetic needle to the east or west of the true geographic north.

The angle of declination of the magnetic needle. (See *Declination, Angle of.*)

**Variation, Annual** — — An approximately regular variation in the magnetic

needle which occurs at different seasons of the year.

**Variation Chart or Map.**—(See *Map or Chart, Isogonic.*)

**Variation, Cyclical Magnetic.**—Secular magnetic variations occurring during great cycles of time. (See *Variation, Secular. Variation, Magnetic.*)

**Variation, Diurnal.**—An approximately regular variation of the magnetic needle, which occurs at different hours of the day. (See *Declination.*)

**Variation, Irregular.**—A variation of the magnetic needle which occurs at irregular intervals. (See *Declination.*)

**Variation, Magnetic.**—Variations in the value of the magnetic declination, or inclination, that occur simultaneously over all parts of the earth.

The term is also applied to the magnetic declination itself.

These variations are:

(1.) Secular, or those occurring at great cycles of time.

(2.) Annual, or those occurring at different seasons of the year.

(3.) Diurnal, or those occurring at different hours of the day.

(4.) Irregular, or those accompanying magnetic storms. The first three are periodical; the last is irregular. (See *Declination, Angle of, Chart, Inclination.*)

**Variation, Secular.**—A variation in the magnetic declination which occurs at great cycles or intervals of time. (See *Declination.*)

**Variation of Circuits.**—(See *Circuits, Varieties of.*)

**Variometer, Magnetic.**—An instrument for comparing the horizontal component of the earth's magnetism in different localities.

**Varnish, Electric.**—A varnish formed of any good insulating material.

Shellac dissolved in alcohol, applied to a

thoroughly dried surface and afterwards hardened by baking, forms an excellent varnish.

**Varnish, Stopping-Off.**—A varnish used in electro-plating to cover portions which are not to receive the metallic coating.

A good stopping-off varnish is made by mixing together 10 parts of resin, 6 parts of beeswax, 4 parts of sealing-wax and 3 parts of rosin, dissolved in turpentine. (See *Stopping Off.*)

**Vat, Depositing.**—The vat in which the process of electro-plating is carried on. (See *Plating, Electro.*)

The depositing vat contains the plating liquid, the metallic anode and the object to be plated.

**Vegetation, Effects of Electricity on.**—Most vegetable fibres contract when an electric current is passed through them while on the living plant.

Some experiments appear to show that electric charges and currents hasten the germination and growth of certain plants. Other experiments seem to show that under certain circumstances electric currents retard plant growth. The direction of the currents is probably of main importance.

**Velocimeter.**—Any apparatus for measuring the speed of a machine.

**Velocity, Angular.**—The velocity of a body moving in a circular path, measured, not as usual, by the length of its path divided by the time, but with reference to the angle it subtends and to the length of the radius.

Unit angle is that angle subtended by a part of the circumference equal to the length of the radius, or 57 degrees 17 minutes 44 seconds .8 nearly.—(Daniell.)

Unit angular velocity is the velocity under which a particle moving in a circular path, whose radius equals unity, would traverse unit angle in unit time.

**Velocity, New Unit of.**—The kine. (See *Kine.*)

**Velocity of Discharge.**—(See *Discharge, Velocity of.*)

**Velocity Ratio.**—(See *Ratio, Velocity.*)

**Ventilation of Armature.**—(See *Armature, Ventilation of*.)

**Vernier.**—A device for the more accurate measurement of small differences of length than can be detected by the eye alone, by means of the direct reading of the position of a mark on a sliding scale.

The sliding scale is called the vernier. There are a variety of vernier scales in use.

**Vertical Component of Earth's Magnetism.**—(See *Component, Vertical, of Earth's Magnetism*.)

**Vertical Electrostatic Voltmeter.**—(See *Voltmeter, Vertical, Electrostatic*.)

**Verticity, Poles of, Magnetite** — —The earth's magnetic poles, as determined by means of the dipping needle.

The point of the north where the angle of dip is 90 degrees. (See *Map or Chart, Inclination*.)

**Vibrating.**—Moving to-and-fro.

**Vibrating Bell.**—(See *Bell, Vibrating*.)

**Vibrating Contact.**—(See *Contact, Vibrating*.)

**Vibration.** A to-and-fro motion of the particles of an elastic medium. (See *Wave*.)

**Vibration or Wave, Amplitude of** — —The ratio that exists in a wave between the degree of condensation and rarefaction of the medium in which the wave is propagated.

The amplitude of a wave is dependent on the amount of energy charged on the medium in which the vibration or wave is produced.

A vibration or wave is a to-and-fro motion produced in an elastic material or medium by the action of energy thereon. Sound, light and heat are subjectively effects produced by the action of vibrations or waves, which in the case of sound are set up in the air, and, in that of light and heat, in a highly tenuous medium called the luminiferous ether. Objectively they are the waves themselves.

As the amplitude of a sound wave increases, the loudness or intensity of the sound increases. As the amplitude of the ether wave increases, the brilliancy of the light or the intensity of the light or heat increases.

Let A C, Fig. 561 represent an elastic cord or string tightly stretched between A and C. If the string be plucked by the finger, it will move to-and-fro, as shown by the dotted lines. Each to-and-fro motion is called a *vibration*. The



Fig. 561. Amplitude of Wave.

vertical distance B D, or B E, represents the *amplitude* of the vibration, and the sound produced is louder, the greater the amount of energy with which the string has been plucked, or, in other words, the greater the value of B D, or B E.

Vibrations assume various forms in solid or fluid media, but in all cases the amplitude will increase with the increase in the energy that causes the vibration.

**Vibration Period.**—(See *Period, Vibration*.)

**Vibration, Period of** — —The time occupied in executing one complete vibration or motion to-and-fro.

**Vibration, Phase of** — —The position of the particles in motion in a wave or vibration at any instant of time during the wave period, as compared with a zero line, or a line passing through their mean or middle position.

**Vibrations, Isochronous** — —Vibrations which perform their to-and-fro motions on either side of the position of rest in equal times.

The vibrations of a pendulum are practically isochronous, no matter what the amplitude of the swing may be, that is, whether the pendulum swings through a large arc or a small arc, provided this arc be not very great.

All vibrations that produce musical sounds may be regarded as isochronous; that is, in any case, the time required to complete a to-and-fro motion is the same at the beginning when the sound is loud, as at the end, when it is faint.

**Vibrations, Sympathetic** — —Vibrations set up in bodies by waves of exactly the same wave rate as those produced by the vibrating body.

The pitch or tone of the note produced by the body set into sympathetic vibration, is exactly the



same as the pitch or tone of the exciting waves or vibrations.

Hertz's experiments show that sympathetic vibrations are excited by electro-magnetic waves. (See *Electricity, Hertz's Theory of Electro-Magnetic Radiations or Waves.*)

**Vibrations, Sympathetic, Electrical** —

—Vibrations set up in circuits, by the effect of pulses in neighboring circuits, that are of exactly the same mean length.

**Vibrations, Synchronous** —

—Vibrations that are performed not only in the same time as one another, but which pass through the same portions of their to-and-fro movement at the same time.

**Vibrator, Electro-Magnetic** —

—A lever, or arm, automatically moved to-and-fro by the alternate attractions of an electro-magnet and an opposing spring, or by the successive action of two electro-magnets.

In either case the movement of the lever is utilized to permit the action of first one and then the other device. Automatic or trembling bells are operated by means of an electro-magnetic vibrator.

**Villari Critical Point.**—A term proposed by Sir William Thomson for that strength of magnetic field at which the reversal of the effects of tension occurs.

Both magnetic susceptibility and permeability are affected by mechanical stress, vibration and changes of temperature. In a weak magnetic field the susceptibility of iron wire is increased by longitudinal tension, while in a strong field it may be decreased. The particular strength of field at which the reversal occurs is called the Villari critical point.

**Viscosity, Magnetic** —

—That property of iron or other paramagnetic substance in virtue of which a certain time is required before a given magnetizing force can produce its effects. (See *Hysteresis, Viscous.*)

**Viscous Hysteresis.**—(See *Hysteresis, Viscous.*)

**Vis-Viva.**—

The energy stored in a moving body, and therefore the measure of the amount of work that must be performed in order to bring a moving body to rest.

If  $M$ , is the mass and  $V$ , the velocity

$$\text{The Vis-Viva} = \frac{MV^2}{2}.$$

**Vitreous Electricity.**—(See *Electricity, Vitreous.*)

**Vitrite.**—An insulating substance.

**Volatilization, Electric** — —A term sometimes used instead of electric evaporation.—(See *Evaporation, Electric.*)

**Volcanic Lightning.**—(See *Lightning, Volcanic.*)

**Volt.**—The practical unit of electromotive force.

Such an electromotive force as is induced in a conductor which cuts lines of magnetic force at the rate of 100,000,000 per sec.

Such an electromotive force as would cause a current of one ampère to flow against the resistance of one ohm.

Such an electromotive force as would charge a condenser of the capacity of one farad with a quantity of electricity equal to one coulomb.

$10^9$  absolute electro-magnetic units of electromotive force.

**Volt-Ammeter.**—A wattmeter.

A variety of galvanometer capable of directly measuring the product of the difference of potential and the ampères. (See *Wattmeter.*)

**Volt Ampère.**—A watt. (See *Watt.*)

**Volt-Coulomb.**—The unit of electric work. The joule. (See *Joule.*)

**Volt, Mega** — —One million volts.

**Volt, Micro** — —The one-millionth of a volt.

**Voltage.**—This term is now very commonly used for either the electromotive force or difference of potential of any part of a circuit as determined by the reading of a voltmeter placed in that part of the circuit.

**Voltage, Terminal** — —The electromotive force expressed in volts of a dynamo or other electric source, as indicated by a voltmeter placed across its terminals.

The terminal voltage is greater than that on the leads or conductors at some distance from

the source and less than that generated by the source.

There is an exception to this general statement in the case of certain leads connected with an alternating dynamo-electric machine. (See *Effect, Ferranti*.)

**Voltaic Arc.**—(See *Arc, Voltaic*.)

**Voltaic Battery.**—(See *Battery, Voltaic*.)

**Voltaic Battery Indicator.**—(See *Indicator, Voltaic Battery*.)

**Voltaic Battery Protector.**—(See *Protector, Voltaic Battery*.)

**Voltaic Cell.**—(See *Cell, Voltaic*.)

**Voltaic Cell, Bichromate** — —(See *Cell, Voltaic, Bichromate*.)

**Voltaic Cell, Bunsen's** — —(See *Cell, Voltaic, Bunsen's*.)

**Voltaic Cell, Callaud's** — —(See *Cell, Voltaic, Callaud's*.)

**Voltaic Cell, Capacity of Polarization of** — —(See *Cell, Voltaic, Capacity of Polarization of*.)

**Voltaic Cell, Closed-Circuit** — —(See *Cell, Voltaic, Closed-Circuit*.)

**Voltaic Cell, Contact Theory of** — —(See *Cell, Voltaic, Contact Theory of*.)

**Voltaic Cell, Creeping of** — —(See *Cell, Voltaic, Creeping in*.)

**Voltaic Cell, Daniell's** — —(See *Cell, Voltaic, Daniell's*.)

**Voltaic Cell, Double-Fluid** — —(See *Cell, Voltaic, Double-Fluid*.)

**Voltaic Cell, Dry** — —(See *Cell, Voltaic, Dry*.)

**Voltaic Cell, Gravity** — —(See *Cell, Voltaic, Gravity*.)

**Voltaic Cell, Grenet** — —(See *Cell, Voltaic, Grenet*.)

**Voltaic Cell, Grove** — —(See *Cell, Voltaic, Grove*.)

**Voltaic Cell, Leclanché** — —(See *Cell, Voltaic, Leclanché*.)

**Voltaic Cell, Local Action of** — —(See *Action, Local, of Voltaic Cell*.)

**Voltaic Cell, Meidinger** — —(See *Cell, Voltaic, Meidinger*.)

**Voltaic Cell, Negative Plate of** — —(See *Plate, Negative, of Voltaic Cell*.)

**Voltaic Cell, Open-Circuit** — —(See *Cell, Voltaic, Open-Circuit*.)

**Voltaic Cell, Poggendorff** — —(See *Cell, Voltaic, Poggendorff*.)

**Voltaic Cell, Polarization of** — —(See *Cell, Voltaic, Polarization of*.)

**Voltaic Cell, Positive Plate of** — —(See *Plate, Positive, of Voltaic Cell*.)

**Voltaic Cell, Siemens-Halske** — —(See *Cell, Voltaic, Siemens-Halske*.)

**Voltaic Cell, Simple** — —(See *Cell, Voltaic, Simple*.)

**Voltaic Cell, Single-Fluid** — —(See *Cell, Voltaic, Single-Fluid*.)

**Voltaic Cell, Smee** — —(See *Cell, Voltaic, Smee*.)

**Voltaic Cell, Standard** — —(See *Cell, Voltaic, Standard*.)

**Voltaic Cell, Standard, Clark's** — —(See *Cell, Voltaic, Standard, Clark's*.)

**Voltaic Cell, Standard, Clark's, Rayleigh's Form of** — —(See *Cell, Voltaic, Standard, Rayleigh's Form of Clark's*.)

**Voltaic Cell, Standard, Fleming's** — —(See *Cell, Voltaic, Standard, Fleming's*.)

**Voltaic Cell, Standard, Lodge's** — —(See *Cell, Voltaic, Standard, Lodge's*.)

**Voltaic Cell, Standard, Sir Wm. Thomson's** — —(See *Cell, Voltaic, Standard, Sir William Thomson's*.)

**Voltaic Cell, Standardizing** — —(See *Cell, Voltaic, Standardizing a*.)

**Voltaic Cell, Two-Fluid** — —(See *Cell, Voltaic, Two-Fluid*.)

**Voltaic Cell, Water** — —(See *Cell, Voltaic, Water*.)

**Voltaic Cell, Zinc-Carbon** — —(See *Cell, Voltaic, Zinc-Carbon*.)

**Voltaic Cell, Zinc-Copper** — —(See *Cell, Voltaic, Zinc-Copper*.)

**Voltaic Circle.**—(See *Circle, Voltaic*.)

**Voltale Circuit.**—(See *Circuit, Voltaic*.)

**Voltale Couple.**—(See *Couple, Voltaic*.)

**Voltale Effect.**—(See *Effect, Voltaic*.)

**Voltale Electricity.**—(See *Electricity, Voltaic*.)

**Voltale Element.**—(See *Element, Voltaic*.)

**Voltale or Current Induction.**—(See *Induction, Voltaic*.)

**Voltameter.**—An electrolytic cell employed for measuring the quantity of the electric current passing through it by the amount of chemical decomposition effected in a given time.

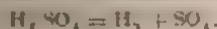
Various electrolytes are employed in voltameters, such as aqueous solutions of sulphuric acid, copper sulphate, or other metallic salts.

In the sulphuric acid voltameter shown in Fig. 552, the battery terminals are connected with platinum electrodes, immersed in water slightly acidulated with sulphuric acid, and placed inside glass tubes, also filled with acidulated water. On the passage of the current hydrogen appears at the kathode, and oxygen at the anode, in nearly the proportion of two volumes to one. (See *Chem.*)



Fig. 552. A Sulphuric Acid Voltameter.

In the case of water containing sulphuric acid (*hydrogen sulphate*) the decomposition would appear to be that of the sulphuric acid rather than that of the water. The reaction is as follows:



The hydrogen appears at the electro negative terminal or *kathode*. The  $SO_4$  appears at the electro positive terminal or *anode*, but combines with one molecule of water, thus,  $SO_4 + H_2O = H_2SO_4 + O$ , gaseous oxygen being driven off at the anode.

Voltameters are not as well suited as galvanometers for the measurement of electric currents, because a certain electromotive force must be reached before electrolysis is effected.

The voltameter in reality measures the coulombs, and, therefore, is valuable as a current measurer only when the current is constant.

Coulomb-meter would, therefore, be the preferable term.

Then, again, time is required to produce the results, and considerable difficulty is experienced in maintaining the current strength constant, either on account of variations in the electromotive force of the source, or of variations in the resistance of the voltameter.

**Voltameter, Copper.**—A voltameter in which the quantity of the current passing is determined by the weight of copper deposited.

A current, the strength of which is constant, is passed through the voltameter for a given time. The kathode, preferably of platinum, is thoroughly cleaned and dried with a current of heated air and accurately weighed before and after. The current strength is then deduced from the increase in weight and the time.

A galvanometer is kept in the circuit of the battery and voltameter. If a Daniell battery is used, it should be kept on closed-circuit through a resistance for some time before use, in order to insure normal current.

It will be noticed that the indications of this voltameter are based on the gain in weight of the kathode. The loss in weight of the anode is misleading, owing to secondary chemical action and disintegration.

**Voltameter, Gas.**—A term sometimes used for volume voltameter. (See *Voltameter, Volume*.)

**Voltameter, Siemens' Differential.**—A form of voltameter employed by Sir William Siemens for determining the resistance of the platinum spiral used in his electric pyrometer. (See *Pyrometer, Siemens' Electric*.)

Two separate voltameter tubes, provided with platinum electrodes and filled with dilute sulphuric acid, are provided with carefully graduated tubes to determine the volume of the decomposed gases. (See *Voltameter, Volume*.)

A current from a battery is divided by a suitable commutator into two circuits connected respectively with the two voltameter tubes. In one of these circuits a known resistance is placed; in the other the resistance to be measured, i. e., the platinum coil used in the electric pyrometer.



**Voltmeter, Silver** — — A voltmeter in which the quantity of the current passing is determined by the weight of silver deposited.

A solution of silver nitrate is used as the electrolytic liquid. When the current to be measured is strong the strength of the silver nitrate solution is made stronger.

**Voltmeter, Volume** — — A voltmeter in which the quantity of the current passing is determined by the volume of the gases evolved.

In some forms of volume voltmeter in which dilute sulphuric acid is electrolyzed, both the hydrogen and the oxygen are measured, either separately or together.

In one form of volume voltmeter the hydrogen only is collected, and thus the error in volumetric determinations arising from the decrease in volume from the formation of ozone is avoided. The evolved oxygen is isolated from the hydrogen by placing a porous jar between the electrodes. The negative electrode, is formed of platinum fused in the tube, which, for ease of connection, is partially filled with mercury.

The graduated glass tube, in which the hydrogen is collected, is maintained at a nearly constant temperature by means of a water column. A thermometer is provided for corrections of volume as affected by temperature.

The voltmeter contains dilute sulphuric acid, about 30 per cent. of acid.

**Voltmeter, Weight** — — A voltmeter in which the quantity of the current passing is determined by the difference in the weight of the instrument after the circuit has passed for a given time.

A weight voltmeter consists essentially of platinum electrodes and some means for thoroughly drying the evolved gases. A vessel filled with pumice stone moistened with sulphuric acid, or a chloride of calcium tube, may be used for this purpose. The voltmeter is carefully weighed before and after the decomposition. The difference in weight gives the weight of the sulphuric acid decomposed.

**Voltametric Law.** (See *Law, Voltametric*.)

**Voltmeter.**—An instrument used for meas-

uring difference of potential. (See *Galvanometer, Potential, Difference of, Volt.*)

A voltmeter may be constructed on the principle of a galvanometer, in which case it differs from an ammeter, or ampère meter, which measures the current, principally in that the resistance of its coils is greater, and that in an ampère meter the coils are placed in the circuit, while in a voltmeter they are placed as a shunt to the circuit.

The difference of potential is determined from the reading of a voltmeter, by the fact that according to Ohm's law, the product of the current and the resistance is equal to the electromotive force,

as  $C = \frac{E}{R}$  from which we obtain  $C \times R = E$ .

In the ordinary operation of a voltmeter, the action of the current in passing through a coil of insulated wire is to produce a magnetic field, which causes the deflection of a magnetic needle. Since the resistance of the voltmeter is constant, the current passing, and hence the deflection of the needle, will vary with the value of  $E$ . The magnetic field produced by the current deflects the magnetic needle against the action of another field, which may be either the earth's field, or an artificial field produced by a permanent or an electro-magnet. Or, it may deflect it against the action of a spring, or against the force of gravity acting on a weight. There thus arise varieties of voltmeters, such as permanent magnet voltmeters, spring voltmeters, and gravity voltmeters.

Or, the current produced by a given difference of potential may be used to heat a wire, and the value of the potential difference determined by the movement of a needle by the consequent expansion of a wire. Cardew's voltmeter operates on this principle. (See *Voltmeter, Cardew's*.)

Or, the potential difference to be measured may be utilized to charge a readily movable needle, and thus produce electrostatic attractions and repulsions.

This form of instrument is in reality a form of electrometer. (See *Electrometer, Quadrant, Attraction, Electrostatic*.)

**Voltmeter, Cardew's** — — A form of voltmeter in which the potential difference is measured by the amount of expansion caused by the heat of a current passing through a fixed resistance.

The current produced by the difference of potential to be measured is passed through a high

resistance wire of platinum silver, the expansion of which is caused to move a needle across a graduated arc. The wire is thin and therefore quickly acquires the temperature due to the current.

The Cardew voltmeter possesses an advantage of being independent of changes of temperature. It is also capable of being used to measure the potential difference of alternating currents.

**Voltmeter, Closed-Circuit** — —A voltmeter in which the points of the circuit, between which the potential difference is to be measured, are connected with a closed coil or circuit, and which gives indications by means of the current so produced in said circuit.

All galvanometer-voltmeters are of the closed-circuited type.

The Weston standard voltmeter shown in Fig. 563 is a closed-circuit voltmeter.



Fig. 563. Weston Standard Voltmeter.

**Voltmeter, Electro-Magnetic** — —A form of voltmeter in which the difference of potential is measured by the movement of a magnetic needle in the field of an electro-magnet. (See *Voltmeter*.)

**Voltmeter, Gravity** — —A form of voltmeter in which the potential difference is measured by the movement of a magnetic needle against the pull of a weight.

Sir William Thomson's balance instruments are used as gravity voltmeters. (See *Voltmeter*.)

**Voltmeter, Magnetic-Vane** — —A voltmeter in which the potential difference is measured by the repulsion exerted between a

fixed and a movable vane of soft iron placed within the field of the magnetizing coil.

A pointer, fixed to the moving vane, serves to measure the amount of the repulsion, and consequently the potential difference producing the magnetizing current. The moving vane moves under the magnetic repulsion against the action of a spring. Discs of copper for damping the movements of the movable vane, are placed before and behind it.

**Voltmeter, Multi-Cellular Electrostatic** — —An electrostatic voltmeter in which a series of fixed and movable plates are used instead of the single pair employed in the quadrant electrometer.

The movable pairs of plates are connected to a movable axis and placed vertically above one another. To the top of the axis is fixed a light aluminum needle or pointer, which moves over a graduated scale. A series of fixed plates, suitably supported and insulated from the ground, alternate with the needle plates.

**Voltmeter, Open-Circuit** — —A voltmeter in which the points of the circuit where potential difference is to be measured are connected with an open circuit and give indications by means of the charges so produced.

Electrometer-voltmeters are of the open-circuited type.

**Voltmeter, Permanent Magnet** — —A form of voltmeter in which the difference of potential is measured by the movement of a magnetic needle under the combined action of a coil and a permanent magnet, against the pull of a spring. (See *Voltmeter*.)

**Voltmeter, Reducteur or Resistance for** — —(See *Reducteur or Resistance for Voltmeter*.)

**Voltmeter, Vertical Electrostatic** — —A form of voltmeter the needle of which moves in a vertical instead of in a horizontal plane.

The construction of the vertical electrostatic voltmeter is, in general, similar to that of the quadrant electrometer. (See *Electrometer, Quadrant*.)

The fixed and movable sectors, the pointer and the graduated scale, however, are in vertical instead of horizontal planes.

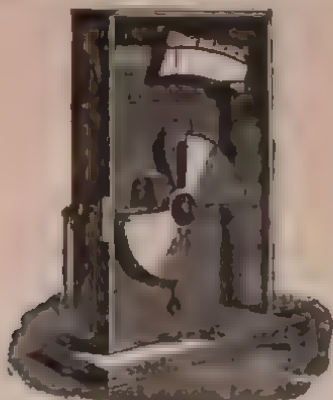


Fig. 564. Vortex Electrostatic Voltmeter.

The general arrangement of the vertical electrostatic voltmeter will be readily understood by an inspection of Fig. 564.

**Volume Voltmeter.**—(See *Voltmeter, Volume.*)

**Vortex Atom.**—(See *Atom, Vortex.*)

**Vortex Cylinder.**—(See *Cylinder, Vortex.*)

**Vortex-Ring Field.**—(See *Field, Vortex-Ring.*)

**Vulcanite.**—An insulating substance composed of asbestos and rubber.

**Vulcanite.** A variety of vulcanized rubber extensively used in the construction of electric apparatus.

Vulcanite is sometimes called ebonite from its black color. It is also sometimes called hard rubber.

Though an excellent insulator, vulcanite will lose its insulating properties by condensing a film of moisture on its surface. This can be best removed by the careful application of heat.

The surface is very liable to become covered by a film of sulphuric acid, due to the gradual oxidation of the sulphur. More friction will not remove this film, but it may be removed by washing with distilled water. A thick coating of varnish will obviate this last defect.

**Vulcanized Fibre.**—(See *Fibre, Vulcanized.*)

## W

**W.**—A contraction sometimes used for watt.

**W.**—A contraction sometimes used for work.

**W.**—A contraction sometimes used for weight.

**Wall Plug.**—(See *Plug, Wall.*)

**Wall Socket.**—(See *Socket, Wall.*)

**Ward.**—A term proposed by James Thomson for a line and direction in a line.

Sir William Thomson thus defines the ward of magnetization: "The ward in which the magnetizing force urges a portion of the ideal northern magnetic matter or northern polarity."

**Waring Anti-Induction Cable.**—(See *Cable, Anti-Induction, Waring.*)

**Waste Field.**—(See *Field, Magnetic, Waste.*)

**Watches, Demagnetization of** — — — Pro-

cesses for removing magnetism from watches.

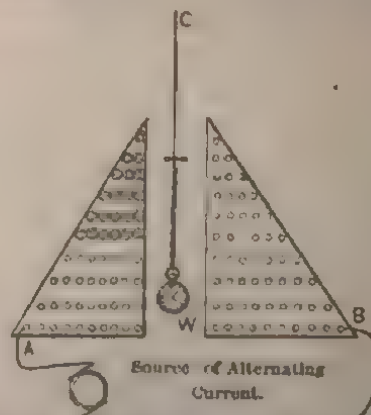


Fig. 565. Wright's Demagnetization Apparatus.

The demagnetization of watches can be readily effected by a method proposed by J. J. Wright.

The watch is held by its chain and slowly lowered to the bottom of a hollow conical coil of wire, and then slowly withdrawn from the coil.

The wire is wound on the coil, as shown in Fig. 565, in the shape of a cone, viz.: with a single turn at the top, and gradually increasing in number of turns towards the bottom. The conical coil is connected with a source of rapidly alternating currents.

As the watch is lowered into the coil, it gradually becomes more and more powerfully magnetized with alternately opposite polarities, thus completely removing any polarity it previously possessed. As it is now slowly raised from out the hollow cone, this magnetization becomes less and less, until, if removed from the conical coil while high above its apex, all sensible traces of magnetism will have disappeared.

**Watchman's Electric Register.**—(See *Register, Watchman's Electric.*)

**Water Battery.**—(See *Battery, Water.*)

**Water-Dropping Accumulator.**—(See *Accumulator, Water-Dropping.*)

**Water, Electrolysis of**—The decomposition of water by the passage through it of an electric current.

Water does not appear to conduct electricity when pure, it is therefore not quite certain that pure water can be electrolytically decomposed. The addition of a small quantity of sulphuric acid, or of a metallic salt, however, renders its electrolysis readily accomplished. (See *Voltameter.*)

In the opinion of most, it is the sulphuric acid that is decomposed rather than the water.

**Water Horse-Power.**—The Indian Government's term for horse-power developed by falling water.

The estimate is made by the following simple rule: 15 cubic feet of water falling per second through 1 foot equals 1 horse power.

**Water-Jet Telephone Transmitter.**—(See *Transmitter, Water-Jet Telephone.*)

**Water-Level Alarm.**—(See *Alarm, Water or Liquid Level.*)

**Water-Proof Wire.**—(See *Wire, Water-Proof.*)

**Water Pyrometer.**—(See *Pyrometer, Siemens' Water.*)

**Water Rheostat.**—(See *Rheostat, Water.*)

**Water Voltaic Cell.**—(See *Cell, Voltaic, Water.*)

**Watt.**—The unit of electric power. The volt-ampère.

The power developed when 44.25 foot-pounds of work are done per minute, or 0.7375 foot-pounds per second.

The  $\frac{746}{1000}$  of a horse-power.

There are three equations which give the value of the watts, viz.:

(1.)  $C E =$  The watts.

(2.)  $C^2 R =$  The watts.

(3.)  $\frac{E^2}{R} =$  The watts.

Where  $C$  = the current in amperes;  $E$  = the electromotive force in volts, and  $R$  = the resistance in ohms. (See *Energy, Electric.*)

**Watt Arc.**—(See *Arc, Watt.*)

**Watt Generator.**—(See *Generator, Watt.*)

**Watt-Hour.**—A unit of electric work.

A term employed to indicate the expenditure of an electrical power of one watt, for an hour.

**Watt-Hour, Kilo** — — The Board of Trade unit of work equal to an output of one kilo-watt for one hour.

**Watt, Kilo** — — One thousand watts.

A unit of power sometimes used in stating the output of a dynamo.

A dynamo of 20 units, or a 20-unit machine, is one capable of giving an output of 20 kilo watts.

**Watt-Meter.**—A galvanometer by means of which the simultaneous measurement of the difference of potential and the current passing is rendered possible.

The watt-meter consists of two coils of insulated wire, one coarse and the other fine, placed at right angles to each other as in the ohm-meter, only, instead of the currents acting on a suspended magnetic needle, they act on each other as in the electro-dynamometer.

**Watt-Minute.**—A unit of electric work.

An expenditure of electric power of one watt for one minute.

**Watt-Second.**—A unit of electric work.

An expenditure of electric power of one watt for one second.

**Wave.**—A disturbance in an elastic medium that is periodic both in space and time.

**Wave, Electric** — —An electric disturbance in an elastic medium that is periodic both in space and time. (See *Oscillations, Electric*.)

**Waves, Amplitude of** — —The amplitude of a vibration. (See *Vibration or Wave, Amplitude of*.)

**Waves, Displacement** — —Waves produced in the ether of dielectrics by means of electric displacement.

The electric stress applied to a dielectric to produce electric displacement soon strains it to its utmost and no further displacement can occur until the direction of the electric power is reversed. A rapidly intermittent current therefore can pass through a dielectric and thus produce a series of displacement waves.

Dielectrics, therefore, may be considered as pervious or transparent to rapidly intermittent or reversed periodic currents, but opaque or impervious to continuous currents. A condenser interpolated in a telephone circuit does not prevent telephonic communication, though it does effectually stop all continuous currents.

**Waves, Electro-Magnetic** — —Waves in the ether that are given off from a circuit through which an oscillating discharge is passing, or from a magnetic circuit undergoing variations in magnetic intensity.

**Waves, Electro-Magnetic, Interference of** — —Interference effects similar to those produced in the case of waves of light, observed in the case of electro-magnetic radiations, or waves, in which one system of waves, retarded a half wave length behind another system of equal wave length and amplitude, results in a complete loss of motion of the particles of the ether they tend to simultaneously affect.

In order that complete interference may take place, it is necessary

(1.) That the two waves, or system of waves, must meet in opposite phases. That is, that one be retarded back of the other one-half a wave length, or some odd number of half wave lengths.

(2.) That the waves simultaneously affect the

same particles of ether in which they are moving.

(3.) That the energy charged on the ether in the shape of waves of electro-magnetic radiation, must be equal in the case of each system of waves.

(4.) That the two systems of waves must have the same wave length.

These conditions, it will be seen, are exactly the same as in the case of the interference of light.

It will, of course, be readily understood that if electro-magnetic radiations can produce the effect of resonance, they must also necessarily produce interference effects.

**Waves, Electro-Magnetic, Reflection of** — —Reflection of electro-magnetic waves similar to the reflection of waves of light.

In his experiments on electro-magnetic radiations, Dr. Hertz shows that true reflection of electro-magnetic waves occurs from the surfaces of certain substances placed in the path of the waves.

In some experiments made in a large room, Dr. Hertz obtained undoubted indications of reflection of electro-magnetic waves from the walls of the room.

**Waves of Condensation and Rarefaction.** —The alternate spheres of condensed and rarefied air by means of which sound is transmitted. (See *Waves, Sound*.)

**Waves, Sound** — —Waves produced in air or other elastic media by the vibrations of a sonorous body. (See *Sound*.)

**Way Line.**—(See *Line, Way*.)

**Weather Cross.**—(See *Cross, Weather*.)

**Weber.**—A term formerly employed for the unit of electric current, and replaced by ampère. (See *Ampère*.)

The term weber was originally used to express a quantity of electricity equal to what is now called one coulomb, and a current designated by one weber per second. It was, however, used finally as a unit of current.

**Weber.**—A term proposed by Clausius and Siemens for a magnetic pole of unit strength, but not adopted.

This same term was also employed to designate the unit strength of current, now replaced by the term ampère.



**Weber's Theory of Diamagnetism.**—(See *Diamagnetism, Weber's Theory of*.)

**Weight, Atomic.**—The relative weights of the atoms of elementary substances.

Since the atoms are assumed to be indivisible, they must unite or combine as wholes and not as parts. Although we cannot determine exactly the actual weights of the different elementary atoms, yet we can determine their relative weights by ascertaining the smallest proportions in which any two elements that combine atom for atom will unite with each other. Such numbers will represent the relative weights of the atoms as compared with hydrogen.

**Weight Voltmeter.**—(See *Voltmeter, Weight*.)

**Weights and Measures, Metric System of.**—A system of weights and measures adopted by almost all civilized nations except English-speaking, and by the scientific world generally.

For measures of length, the one ten-millionth part of the quadrant of a meridian of the earth is taken as the unit of length. This unit of length is called a metre, and various subdivisions and multiples of its length are made on the decimal system.

For a system of weights, the weight of one cubic centimetre of pure water at 39.2 degrees Fahr., the temperature of the maximum density of water, is taken as the unit of weight. This is called a gramme, and various multiples and subdivisions of this unit are made on the decimal system.

The following table of French measures and their corresponding English values are taken from Deschanel's "Elementary Treatise on Natural Philosophy":

#### *Length*

1 millimetre = .03937 inch, or about  $\frac{1}{25}$  inch.  
 1 centimetre = .3937 inch  
 1 decimetre = 3.937 inches.  
 1 metre = 39.37 inches = 3.281 feet = 1.0936 yard.  
 1 kilometre = 1093.6 yards, or about  $\frac{5}{8}$  mile.  
 Deschanel gives the length of the meter as equal to 39.370432 inches.

U. S. Coast Survey Bull. No. 9 of 1889, gives value of meter = 39.36980 inches. Therefore, 39.37 is probably as accurate as any other figure.

#### *Area.*

1 square millimetre = .00155 square inch.  
 1 square centimetre = .155 square inch.  
 1 square decimetre = 15.5 square inches.  
 1 square metre = 1550 square inches = 10.764 square feet = 1.196 square yards.

#### *Volume.*

1 cubic millimetre = .000061 cubic inch.  
 1 cubic centimetre = .061025 cubic inch.  
 1 decimetre = 61.0254 cubic inches.  
 Cubic metre = 61025 cubic inches = 35.3156 cubic feet = 1.308 cubic yards.  
 The litre (used for liquids) is the same as the cubic decimetre, and is equal to 1.7617 pint, or .22021 gallon.

#### *Mass and Weight.*

1 milligramme = .01543 grain.  
 1 gramme = 15.432 grains.  
 1 kilogramme = 15432.3 grains = 2.205 pounds avoirdupois.  
 More accurately, the kilogramme is 2.20462125 pounds.

#### *Miscellaneous.*

1 gramme per square centimetre = 2.0481 pounds per square foot.  
 1 kilogramme per square centimetre = 14.223 pounds per square inch.  
 1 kilogrammetre = 7.2331 foot-pounds.  
 1 *force de cheval* = 75 kilogrammetres per second, or 542½ foot pounds per second, nearly, whereas 1 horse-power (English) = 550 foot-pounds per second.

#### *Conversion of English into French measures;*

##### *Length.*

1 inch = 2.54 centimetres, nearly.  
 1 foot = 30.48 centimetres, nearly.  
 1 yard = 91.44 centimetres, nearly.  
 1 statute mile = 1609.33 centimetres, nearly.  
 More accurately, 1 inch = 2.5399772 centimetres.

##### *Area.*

1 square inch = 6.45 square centimetres, nearly.  
 1 square foot = 929 square centimetres, nearly.  
 1 square yard = 8361 square centimetres, nearly.  
 1 square mile =  $2.59 \times 10^{10}$  square centimetres, nearly.

##### *Volume.*

1 cubic inch = 16.39 cubic centimetres, nearly.  
 1 cubic foot = 28316 cubic centimetres, nearly.



1 cubic yard = 764535 cubic centimetres, nearly.

1 gallon = 4541 cubic centimetres, nearly.

#### Mass.

1 grain = .0648 gramme, nearly.

1 ounce avoirdupois = 28.35 grammes, nearly.

1 pound avoirdupois = 453.6 grammes, nearly.

1 ton =  $1.016 \times 10^6$  grammes, nearly.

More accurately, 1 pound avoirdupois = 453.59265 grammes.

#### Velocity.

1 mile per hour = 44.704 centimetres per second.

1 kilometre per hour = 27.7 centimetres per second.

#### Density.

1 pound per cubic foot = .016019 gramme per cubic centimetre.

62.4 pounds per cubic foot = 1 gramme per cubic centimetre.

#### Force (assuming $g = 981$ ).

Weight of 1 grain = 63.57 dynes, nearly.

" 1 ounce avoirdupois =  $2.78 \times 10^4$  dynes, nearly.

" 1 pound avoirdupois =  $4.45 \times 10^5$  dynes, nearly.

" 1 ton =  $9.97 \times 10^6$  dynes, nearly.

" 1 gramme = 981 dynes, nearly.

" 1 kilogramme =  $9.81 \times 10^5$  dynes, nearly.

#### Work (assuming $g = 981$ ).

1 foot-pound =  $1.356 \times 10^7$  ergs, nearly.

1 kilogrammetre =  $9.81 \times 10^7$  ergs, nearly.

Work in a second by one theoretical "horse-power" =  $7.46 \times 10^8$  ergs, nearly.

#### Stress (assuming $g = 981$ ).

1 pound per square foot = 479 dynes per square centimetre, nearly.

1 pound per square inch =  $6.9 \times 10^4$  dynes per square centimetre, nearly.

1 kilogramme per square centimetre =  $9.81 \times 10^5$  dynes per square centimetre, nearly.

760 millimetres of mercury at 0 degree C. =  $1.014 \times 10^5$  dynes per square centimetre, nearly.

30 inches of mercury at 0 degree C. =  $1.163 \times 10^5$  dynes per square centimetre, nearly.

**Welding, Electric** — Effecting the welding union of metals by means of heat of electric origin.

In the process of Elihu Thomson, the metals

are heated to electric incandescence by currents obtained from transformers, and are subsequently pressed or hammered together.

Fig. 566, shows the Thomson apparatus for the direct system of electric welding. The dynamo is combined with the welding apparatus. The armature contains two separate windings; one of fine wire, in series with the field magnet coils, and another of very low resistance, being formed of a U shaped bar of copper. No commutator is used, the alternating currents being well adapted for heating purposes. The terminals of the dynamo arc, therefore directly connected to the clamps that hold the bar to the welder.

Fig. 567, shows the apparatus for the Thomson Indirect System of Electric Welding. This system is applicable to heavy work, and to cases where more than one welding machine is operated by the current from a single dynamo.

In this case a high tension current is converted

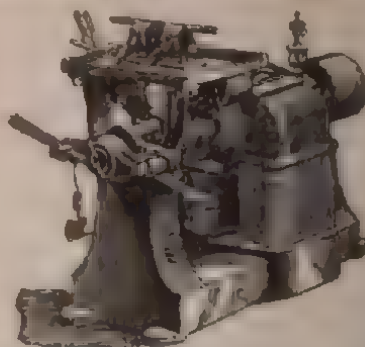


Fig. 566. The Thomson Direct Welder.

into the large welding current employed, by means of a suitably proportioned transformer.

The welding process is the same in either system, and consists essentially in leading the welding current into the pieces to be united through their points of junction when brought into firm end contact. As the current is led across the junction the temperature rises sufficiently to soften the metal, when the pieces are firmly pressed together by the motion of the clamps or holders.

In the process of Benardos and Olzewski, the heat of the voltaic arc is employed for a somewhat similar purpose, but by a different process.

In the Thomson system of electric welding alternating currents are employed. They are either supplied by an alternating current dynamo or by a transformer.

The process of welding is substantially as fol-

lows, viz.: the welding junctions are made slightly convex, so as to touch in but one part of their opposing faces. They are made to touch near their centres and the welding heat is first reached near their points of junction. Pressure is then applied by means of a screw, lever or hydraulic pressure until all the surfaces are at the welding temperature.

This operation requires in practice but a few seconds for small work, and at the most but a

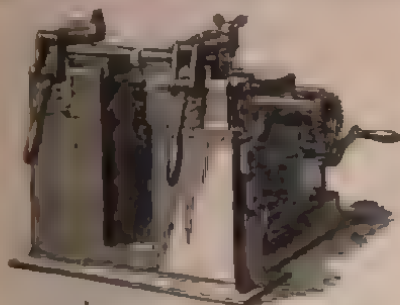


Fig. 567. The Thomson Indirect Welder

few minutes for larger work. The heating is practically local, extending in most cases a distance equal to about the diameter of the weld.

For the purpose of controlling the electro-motive force, and thus adapting the same welder to different classes of work, when a transformer is used, a second transformer provided with a movable core is placed in series with the first. A number of coils of insulated wire are placed in a segment of a split ring laminated-core. These may be connected in series or in multiple by a switch. An iron armature placed within the split ring encloses the annular core and acts as the low-resistance secondary. When this is placed so as to embrace the primary coils, the difference of potential will be different than if moved to one side or the other of the ring.

**Welding Transformer.**—(See *Transformer, Welding*.)

**Wheatstone's Electric Balance.**—(See *Balance, Wheatstone's Electric*.)

**Wheatstone's Electric Bridge.**—(See *Bridge, Wheatstone's Electric*.)

**Wheel, Barlow's or Murgroon's** — — A wheel or disc of metal capable of rotation on a horizontal axis, that is set into rotation when placed between the poles of magnets and

traversed by a current of electricity from the centre to the circumference.

**Wheel, Phonic** — — A wheel maintained in synchronous rotation by means of timed electric impulses sent over a line, and employed in Delany's synchronous multiplex telegraphic system.

The phonic wheel was invented by La Cour, but was first put into successful operation in multiplex telegraphy by Delany in his system of synchronous multiplex telegraphy. (See *Telegraphy, Synchronous Multiplex, Delany's System*.) Delany obtains the exact synchronism of the phonic wheel by means of a series of correcting electric impulses, automatically sent over the line on the failure of the phonic wheel at either end of the line to exactly synchronize with that at the other end.

**Wheel, Reaction, Electric** — — A wheel driven by the reaction of a convective discharge. (See *Flyer, Electric*.)

**Wheel, Trolley** — — A metallic wheel connected with the trolley pole and moved over the trolley wire on the motion of the car over the tracks, for the purpose of taking the current from the trolley wire by means of rolling contact therewith.

**Whirl, Electric** — — A term employed to indicate the circular direction of the lines of magnetic force surrounding a conductor conveying an electric current. (See *Field, Electro-Magnetic*.)

This is more correctly called a magnetic whirl. (See *Whirl, Magnetic*.)

**Whirl, Expanding Magnetic** — — One of the magnetic whirls which are sent out from a conductor through which a current of gradually increasing strength is passing, or from a magnet whose magnetism is increasing.

These magnetic whirls, according to Hertz, move outward through free ether with the velocity of light.

**Whirl, Magnetic** — — The lines of magnetic force which surround the circuit of the conductor conveying an electric current.

**Whistle, Steam, Automatic Electric** — — A steam whistle, employed on foggy days in some systems of railway signals, when the

visual signals cannot be seen, in which the passage of the steam through the whistle is automatically obtained by the closing of an electric contact, or the passage of the locomotive over a certain part of the track.

**White Heat.**—(See *Heat, White*.)

**White Hot.**—(See *Hot, White*.)

**Wimshurst Electrical Machine.**—(See *Machine, Wimshurst Electrical*.)

**Wind, Electric** — —The convection stream of air particles produced at the extremities of points attached to the surface of charged, insulated conductors. (See *Convection, Electric. Flyer, Electric*.)

**Windage of Dynamo.**—A term proposed for the air gap between the armature and the pole pieces of a dynamo.

This term is not much used.

**Winders, Telegraphic Paper** — —Apparatus for winding or coiling the paper fillets used on telegraphic registers.

When moved by means of a spring they are generally styled automatic winders.

**Winding, Ampère** — —A single winding or turn through which one ampère passes.

Ampère-winding is used in the same signification as ampere-turn. (See *Turn, Ampère*.)

**Winding, Bifilar** — —A winding of a coil of wire in which, instead of winding the wire in one continuous length, it is doubled on itself and then wound.

This method is employed in resistance coils, so as to avoid the induction effects. (See *Coil, Resistance*.)

**Winding, Compound, of Dynamo-Electric Machine** — —A method of winding in which shunt and series coils are placed on the field magnets. (See *Machine, Dynamo-Electric, Compound-Wound*.)

**Winding, Series** — —A winding of a dynamo-electric machine in which a single set of magnetizing coils are placed on the field magnets, and connected in series with the armature and the external circuit. (See *Machine, Dynamo-Electric, Series-Wound*.)

**Window-Tube Insulation.**—(See *Insulator, Window-Tube*.)

**Wipe Spark.**—(See *Spark, Wipe*.)

**Wiping Contact.**—(See *Contact, Wiping*.)

**Wire, Air-Line** — —That portion of a circuit which is formed by air-strung wires, in contradistinction to the portion which passes through underground or submarine cables.

**Wire, Binding, for Telegraph Lines** — —The wire used for securing lines of wire conductors to the insulators.

The line wire rests against the insulators at as small an area of contact as possible, generally only a mere edge. In order to attach the wire to the insulator, and protect the wire from chafing, it is secured to the insulator by binding with wire.

**Wire, Block** — —A line or wire employed in a block system for railroads, connecting a block tower with the next tower on each side of it. (See *Railroads, Block System for*.)

**Wire, Braided** — —A conducting wire covered with a braiding, as distinguished from a wire that is merely wrapped with insulating material.

Cotton or silk is used for braiding. The covering is often coated by a layer of some insulating gum or varnish dissolved in a rapidly drying liquid. It is sometimes covered with melted paraffine.

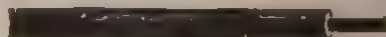


Fig. 565. Braided wire.

A copper wire covered with insulating material and then braided is shown in Fig. 566.

**Wire, Calling** — —A wire employed in a telegraphic or telephonic system, by means of which a subscriber communicates with the central office, or one central office communicates with another.

This wire is termed the *calling* wire in order to distinguish from the wire actually used for talking or telegraphing.

**Wire, Conductibility and Sizes of** — —For tables giving the resistance, size, weight per foot, etc., of wire according to some of the principal wire gauges see pages 254 and 256.

**Wire, Copper, Hard-Drawn** — —Copper wire that is drawn three or four times after annealing.

The drawing subsequent to annealing renders the wire hard and elastic, with but a trifling decrease in its conductivity. A hard-drawn wire, of course, possesses greater limits of elasticity than soft-drawn wire, and, therefore, in the case of air lines, permits of the use of a longer distance between adjacent poles.

**Wire, Copper, Soft-Drawn** — —Copper wire that is softened by annealing after drawing. (See *Wire, Copper, Hard-Drawn*.)

**Wire, Dead, of Armature** — —That part of the wire on the armature of a dynamo which produces no electromotive force or resultant current.

It is called dead because it does not move through the field of the machine.

**Wire, Duplex** — —An insulated conductor containing two separate parallel wires.

**Wire, Earth-Grounded** — —A wire one terminal of which is grounded or put to earth, so that the earth forms a part of the circuit in which the wire is placed.

**Wire, Feeding** — —A term sometimes applied to the wire or lead of a multiple circuit which feeds the main.

In a system of electric railroads the feeding wires feed the trolley wires.

**Wire Finder.**—(See *Finder, Wire*.)

**Wire, Fuse** — —A readily fusible wire employed in a safety catch to open the circuit when the current is excessive. (See *Catch, Safety*.)

**Wire Gauge, Vernier** — —(See *Gauge, Wire, Micrometer*.)

**Wire, Grounded** — —(See *Ground or Earth*.)

**Wire, House** — —In a system of incandescent electric lighting any conductor that is connected with a service conductor and leads to the meter in the house.

**Wire, Insulated** — —Wire covered with any insulating material.

Cotton and silk are generally employed for insulating purposes, either alone, or in connection with various gums, resins, or other materials, which are rendered plastic by heat, but which solidify on cooling. India rubber, caoutchouc, and various mixtures and compounds are also employed for the same purpose.

For most of the purposes of line wires, high insulating powers, combined with a low specific inductive capacity, are required in the insulating materials.

For overhead wires a waterproof covering is necessary. In the neighborhood of combustible materials, some fireproof covering is desirable.

**Wire, Lead** — —A lead fuse wire.

**Wire, Line** — —In telegraphy the wire that connects the different stations with one another.

In bell and annunciator circuits, the term line wire is sometimes applied to all circuits other than the main line.

In arc-light circuits the term line wire is applied to the entire metallic circuit, to which the lamps are connected in series.

**Wire, Main** — —The principal wire.

In any system of bell circuits, the main wire is the wire which runs from one pole of the battery to one of the springs of all the pushes, in distinction from the line wires, or the rest of the wires in the battery circuit.

**Wire, Message** — —A line or wire employed in a block system for railroads, extending along the road and used for local traffic or business. (See *Railroads, Block System for*.)

**Wire, Negative** — —A term sometimes applied to that wire of a parallel circuit which is connected to the negative pole of a source.

**Wire, Neutral** — —The middle wire of a three-wire system of electric distribution.

**Wire, Omnibus** — —An omnibus bar. (See *Bars, Omnibus*.)

A bus bar or wire. (See *Wires, Bus*.)

**Wire, Paraffined** — —Wire wrapped or braided with some textile material and afterwards coated with paraffine.

The term paraffined wire is sometimes limited to a wrapped wire that is afterwards paraffine coated.



**Wire, Positive** — —The wire or conductor connected to the positive pole or terminal of any electric source.

**Wire, Potentiometer** — —The wire of a potentiometer which has been calibrated in order to measure the drop of potential in any circuit. (See *Potentiometer*.)

**Wire, Return** — —The wire or conductor by means of which the current returns to the electric source after having passed through the electro-receptive devices. (See *Sources, Electric, Device, Electro-Receptive*.)

**Wire, Shade Guard** — —(See *Guard, Wire Shade*.)

**Wire, Slide** — A wire of uniform diameter employed in Wheatstone's electric bridge for the proportionate arms of the bridge.

A sliding contact key moves over the slide wire and determines the length of the arms. Some forms of bridges have a double or a triple slide wire. (See *Bridge, Electric, Slide, Form of*.)

**Wire, Span** — The wire employed in systems of electric railways for holding the trolley wire in place.

The span-wire is used when the poles are erected on both sides of the street or road-bed, and the trolley wire, suitably insulated from the span wire, is suspended therefrom.

**Wire, Suspending, of Aerial Cable** — —The wire from which an aerial cable is strung or suspended.

In case the aerial cable is unusually heavy the suspending wire is replaced by a wire rope. (See *Cable, Aerial*.)

**Wire, Taped** — —A conducting wire covered with an insulating material in the shape of tape.

A wire covered with an insulating material and subsequently taped is shown in Fig. 569.

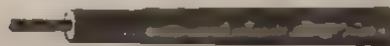


Fig. 569. Taped Wire.

**Wire, Tinned** — —Copper wire covered with a coating of tin prior to its being insulated.

The coating of tin is for the purpose of insuring greater ease in soldering. It is also useful in case vulcanized rubber is used for the insulator, to prevent the sulphur from attacking the copper.

**Wire, To** — —To fix or place the conductors or mains for any electric circuit.

**Wire, Train** — —A line of wire employed in a block system for railroads, connected with the general dispatcher's office, and used for sending train orders only. (See *Railroads, Block System for*.)

**Wire, Trolley** — —The wire over which the trolley passes in a system of electric railways, and from which the current is taken to drive the motors on the cars.

A bare conductor or wire, supported overhead on suitable hangers and provided for transmitting current by the trolley to the motor connected with the car on the passage of the trolley wheel over its surface. (See *Wheel, Trolley*.)

Trolley wires, being necessarily bare, are carefully insulated at their points of attachment to all supports.

**Wire, Trolley, Continuous** — —A trolley wire or conductor employed in overhead dependent systems of electric railways. (See *Railroads, Electric, Dependent System of Motive Power for*.)

**Wire, Trolley, Sectional or Divided** — —A trolley wire or conductor for systems of electric railroads in which the wire is divided into a number of separate sections that are suitably connected with the generating dynamo by means of feeder wires. (See *Railroads, Electric, Dependent System of Motive Power for*.)

**Wire, Trunk** — A main line or wire, extending between two distant stations, such as between two large cities, and provided solely for communication between them, not being tapped at intermediate points.

**Wire, Twin** — —A conductor, consisting of two separately insulated wires, bound together by an additional insulating covering.

**Wire, Water-Proof** — —A wire protected from the weather by a coating of any waterproof material.

**Wire, Wrapped** — — Wire that is insulated by placing strands of some insulating material, like cotton, parallel to its length, and then wrapping a number of strands around the wire.

The wrapped wire is afterwards either coated with paraffine or other insulator, or is used without such coating.

**Wires, Bus** — — A term sometimes used for omnibus bars or wires.

The wires which receive the full current generated by the electric source, and carry it to the feeders.

The bus-wires collect the current from all the sources, hence the name.

**Wire, Breaking-Weight of** — — The weight required to be hung at the end of a wire in order to break it.

Ordinary copper wire will break at about 17 tons to the square inch of area of cross section. Common wrought iron breaks at 25 tons to the square inch. These figures are to be regarded as approximate only, since almost inappreciable differences in the physical condition of metals, as well as slight variations in their chemical composition, often produce marked differences in their breaking weights.

**Wires, Cross** — — (See *Cross, Electric*.)

**Wire, Crossing** — — A device employed in telegraphic circuits whereby a faulty conductor is cut out of the circuit of a telegraph line by crossing over to a neighboring, less used, line.

To cut out a faulty section of wire in any circuit, such as C D, in the circuit A B C D E, Fig. 570, a cross connection is made to a line X Y, running near it, and which may be temporarily thrown out of use. By this means the interruption of an important circuit may be repaired.



Fig. 570. Crossing Wires.

**Wires, Dead** — — Disused and abandoned electric wires.

The term *dead* is often applied to a wire through which no current is passing. The term, however, is more properly applied to a wire formerly employed, but subsequently abandoned.

Dead wires in the neighborhood of active wires are a constant menace to life and property, and should invariably be carefully removed.

It is often a matter of considerable importance to be able to determine whether or not a current is passing through a wire. When the wire is not enclosed in a moulding, or fastened against a wall, this can readily be ascertained by bringing a small compass needle near the wire, when it will tend to set itself across the wire.

The term *dead wire*, as will be seen, is used in two distinct senses.

**Wires, Leading-In** — — The wires or conductors which lead the current through (into and out of) an electric lamp.

The term *leading in wires* is generally applied to incandescent electric lamps, Geissler or Crookes tubes, and to various other apparatus.

**Wires, Leading-Up** — — Wires employed for raising an aerial cable to the cable hangers.

**Wires, Omnibus** — — A term sometimes used for bus wires. (See *Wires, Bus*.)

**Wires or Conductors, Continuous** — — Wires or conductors free from joints.

Wires or conductors without soldered or twisted joints or without any joints whatsoever.

Wires, the entire lengths of which have been taken from the hitherto uncut coil of wire from the draw plate.

Strictly speaking, any metallic circuit consists of a continuous wire, whether in one piece or in several sections or pieces. The preferable term would appear to be *unjoints wires or conductors*.

**Wires, Phantom** — — A term applied to the additional circuits or wires obtained in any single wire or conductor by the use of some multiplex telegraphic system. (See *Telegraphy, Multiplex, Telegraphy, Synchronous-Multiplex, Delany's System*.)

**Wires, Pilot** — — In a system of incandescent lighting, where a comparatively low potential is employed on the mains, thin wires leading directly from the generating station to different parts of the mains, in order to determine the differences of potential at such points.



**Pilot wires** indicate on a voltmeter the difference of potential at the various points. The pilot wires extend to the various seats of supply, and so give instant warning of any change in the value of the potential.

**Wires, Pressure** — — In a system of incandescent electric lighting, wires or conductors, series-connected with the junction boxes, and employed in connection with suitable voltmeters, to indicate the pressure at the junction boxes.

The pressure wires are sometimes called the pilot wires.

**Wires, Tap** — — The wires or conductors used to carry the current from the feeders or mains at the pole to a near point on the trolley wire.

**Wiring.**—Collectively the wires or conducting circuits used in any system of electric distribution.

**Wiring.**—Placing or establishing the wires or conductors for any electric circuit.

**Wiring, Case** — — Placing or establishing electric conductors or wires that are held in place on the walls or ceiling of a room, by means of continuous cleats.

**Wiring, Cleat** — — Placing or establishing electric conductors or wires that are held in place on the walls or ceiling of a room by means of suitably shaped insulating cleats.

**Wiring, Inside** — — The conductors that, in a system of incandescent electric lighting, lead to the interior of the house or area to be lighted.

**Wiring, Moulding** — — Electric conductors or wires that are held in place on the walls or ceiling of a room by means of suitably shaped mouldings.

**Work.**—The product of the force by the distance through which the force acts.

A force whose intensity is equal to one pound acting through the distance of one foot, does an amount of work equal to one foot-pound.

Work is to be distinguished from the more general term energy.

**Work, Electric** — — The joule. (See *Joule*.)

The product of the volts by the coulombs.

1 joule = 10,000,000 ergs, or .73732 foot-pounds.

" = 1 volt-coulomb.

" = 1 watt for 1 second.

**Work, Electric, Unit of** — — The volt-coulomb or joule. (See *Volt-Coulomb*. *Joule*.)

**Work, Unit of** — — The erg.

The amount of work done when a force of one dyne acts through the distance of one centimetre. (See *Erg*.)

Raising one gramme against gravity, through the distance of one centimetre, requires an amount of work equal to 980 ergs.

**Work, Units of** — — Various units employed for the measurement of work.

The following table of Units of Work is taken from Hering's work on *Dynamo-Electric Machines*:

#### WORK.

1 erg .....	= 1 dyne-centimetre.
1 " .....	= .0000001 joule.
1 gramme-centimetre ..	= 981.00 ergs.
1 " ..	= .00001 kilogr.-metre.
1 foot-grain .....	= 1937.5 ergs.
1 joule, or 1 volt-coulomb, or 1 watt during every second or 1 volt-ampère during every second .....	= $\left\{ \begin{array}{l} 10,000,000 \text{ ergs,} \\ .737324 \text{ foot-pound,} \\ .101937 \text{ kilogram-metre,} \\ .0013592 \text{ metric horse-power for one second.} \end{array} \right.$
1 volt ampère during every second .....	= .0013406 horse-power for one second.
" ..	= .0009551 pound-Fah., heat unit.
" ..	= .0005306 pound-Centig., heat unit.
" ..	= .0002407 kilogr.-Centig., heat unit.
" ..	= .0002778 watt-hour.
1 foot-pound .....	= 13562600 ergs.
" ..	= 1.35626 joules.
" ..	= .13825 kilogr. metre.
" ..	= .0018434 metric horse-power for one second.
" ..	= .00181818 horse-power for one second.

1 foot-pound.....	= .0012953 pound-Fah., heat unit.
" .....	= .0007196 pound-Centig., heat unit.
" .....	= .0003264 kilogr.-Centig., heat unit.
" .....	= .0003767 watt-hour.
1 kilogram-metre.....	= 9810000 ergs.
" .....	= 9.81000 joules.
" .....	= 7.23314 foot-pounds.
" .....	= .01333 metric horse-power for one second.
" .....	= .013151 horse power for one second.
" .....	= .009369 pound Fah., heat unit.
" .....	= .005205 pound-Centig., heat unit.
" .....	= .002361 kilogr.-Centig., heat unit.
" .....	= .002725 watt-hour.
1 watt-hour .....	= 3600 joules.
" .....	= 2654.4 foot-pounds.
" .....	= 366.97 kilogram-metres.
" .....	= 3.4383 pound-Fah., heat units.
" .....	= 1.9102 pound-Centig., heat units.
" .....	= .8664 kilogr.-Centig., heat units.
" .....	= .0013592 metric horse-power-hour.
" .....	= .0013406 horse-power-hour.
1 metric h.-p.-hour .....	= 3648700 joules.
" .....	= 1952940 foot-pounds.
" .....	= 270000 kilogram-metres.
" .....	= 2529.7 pound-Fah., heat units.
" .....	= 1405.4 pound-Centig., heat units.
" .....	= 637.5 kilogr.-Centig., heat units.
" .....	= 735.75 watt-hours.
" .....	= 98634 horse-power-hour.
horse-power-hour.....	= 2685400 joules.
" .....	= 1980000 foot-pounds.
" .....	= 273740 kilogram-metres.

1 horse-power-hour....	= 2564.8 pound-Fah., heat units.
" .....	= 1424.9 pound-Centig., heat units.
" .....	= 646.31 kilogr.-Centig., heat units.
" .....	= 745.941 watt-hours.
" .....	= 1.01385 metric horse-power-hour.

## HEAT.

1 gram-Centig.....	= .001 kilogram-Centig-grade.
1 pound-Fahr.....	= 1047.03 joules.
" .....	= 772 foot-pounds.
" .....	= 106.731 kilogram-metres.
" .....	= .55556 pound Centig-grade.
" .....	= .25200 kilogram-Centig-grade.
" .....	= .29084 watt-hour.
" .....	= .0003953 metric horse-power-hour.
" .....	= .0003899 horse-power hour.
1 pound-Centig.....	= 1884.66 joules.
" .....	= 1389.6 foot-pounds.
" .....	= 192.116 kilogram-metres.
" .....	= 1.8000 pound-Fahrenheit.
" .....	= .4536 kilogram Centig-grade.
" .....	= .52352 watt-hours.
" .....	= .0007115 metric horse-power-hour.
" .....	= .0007018 horse-power-hour.
1 kilogram-Centig.....	= 4154.95 joules.
" .....	= 3063.5 foot-pounds.
" .....	= 423.54 kilogram-metres.
" .....	= 3.9683 pound-Fahrenheit.
" .....	= 2.2046 pound-Centig-grade.
" .....	= 1.1542 watt hours.
" .....	= .001569 metric horse-power-hour.
" .....	= .0015472 horse-power-hour.

Working, Direct — — The transmis-

sion of signals over a telegraph line without the use of relays or repeaters.

**Working, Multiple, of a Dynamo-Electric Machine** — —A term sometimes used for the parallel working of dynamo-electric machines. (See *Working, Parallel, of Dynamo-Electric Machines*.)

**Working, Parallel, of Dynamo-Electric Machines** — —The operation of working several dynamo-electric machines as a single source, by connecting them with one another in parallel or multiple arc.

The effect of parallel working is to reduce the internal resistance of the dynamo.

If a current be required in a circuit at an electromotive force equal only to that of a single machine, and the requirements of the circuit are equal to the output of more than a single dynamo, a number of dynamos must then be coupled in multiple.

**Working, Reverse-Current** — — —A term sometimes used in telegraphy for a method of working by means of a double current in place of a single current.

The double-current system of working was devised by Varley to permit Morse characters to be sent rapidly through underground conductors. In order to avoid the retardation due to induction, the current was reversed between each signal. This reversion in the conductor hastened the discharge of the conductor.

**Working, Series, of Dynamo-Electric Machines** — —Such a coupling of several dynamo-electric machines as will deliver the current supplied by them in series.

As in all series connections of sources, there results an electromotive force equal to the sum of the electromotive forces of the different dynamos.

**Worming, Cable** — —A central core of hemp or jute around which are wrapped the several separate conductors of a cable containing more than a single separate conductor.

**Wood's Button Repeater.**—(See *Repeaters, Telegraphic*.)

**Wrapped Wire.**—(See *Wire, Wrapped*.)

**Writing, Electrolytic** — —Imprinting written characters on cloths, or other textile fabrics, by the electrolytic decomposition of a dyeing substance with which they are impregnated.

The cloths, etc., to be written on, are impregnated with an aniline salt, and placed on an insulated metallic plate next to the salt, which is connected to one pole of an electric source. The other pole is connected to a carbon electrode, which is used as the writing stylus or pencil. By suitably connecting the terminals the writing is obtained in color on a white ground, or in white on a colored ground. (See *Dyeing, Electric*.)

**Writing Telegraphy.**—(See *Telegraphy, Writing*.)

## Y

**Y-Shaped Sparks.** — (See *Spark, Y-Shaped*.)

**Yale-Lock-Switch Burglar Alarm.**—(See *Alarm, Yale-Lock-Switch Burglar*.)

**Yoke, Multiple-Brush** — —A term sometimes applied to multiple brush rocker of a dynamo or motor. (See *Rocker, Multiple-Pair Brush*.)

**Yoke, Multiple-Pair Brush** — —A device for holding a number of pairs of brushes of a dynamo-electric machine in such

a manner that they can be readily moved or rotated on the commutator cylinder.

The brushes are placed side by side on the commutator cylinder. In such cases the several pairs of brushes are so arranged that they can be thrown off or out of contact with the commutator cylinder while cleaning the cylinder, without stopping the machine.

**Yoke, Single-Brush** — —A term sometimes used for single-brush rocker. (See *Rocker, Single-Brush*.)

**Yoke, Single-Pair** — — A single-brush rocker. (See *Rocker, Single-Brush*.)

**Yoke, Single-Pair Brush** — — A device for holding a single pair of collecting brushes of a dynamo-electric machine in such a way

that they can be readily moved or rotated on the commutator cylinder.

**Yoked-Horseshoe Electro-Magnet.**—(See *Magnet, Electro, Yoked-Horseshoe*.)

## Z

**Z.**—A symbol sometimes used in electro-therapeutics for contraction.

The use of *Z*, is for the purpose of avoiding the letter *C*, which has already been used for current or ampère in Ohm's law. Increasing strengths of contraction are represented by *Z'*, *Z''*, *Z'''*.

**Z.**—A symbol for electro-chemical equivalent.

**Zero, False** — — A zero taken midway between any two equal and opposite deflections of a measuring instrument.

**Zero, Inferred** — — A zero deduced or inferred from the deflection produced by a charge that is to be measured by comparison with the value of the deflection by means of a known charge in an electrical measuring instrument.

An inferred zero is usually completely off the scale, hence its name. It does not actually exist.

**Zero Methods.**—(See *Method, Null or Zero*.)

**Zero Potential.**—(See *Potential, Zero*.)

**Zero, Shifting** — — A zero that changes or shifts in position; a polar zero in a measuring instrument.

**Zigzag Electro-Magnet.**—(See *Magnet, Electro, Zigzag*.)

**Zigzag Electromotive Force.**—(See *Force, Electromotive, Zigzag*.)

**Zigzag Lightning.**—(See *Lightning, Zigzag*.)

**Zinc, Amalgamation of** — The covering or amalgamation of zinc with a layer of mercury.

To amalgamate a plate of zinc, its surface is first thoroughly cleaned by immersing the plate in dilute sulphuric acid of about 1 part of acid to

10 or 12 parts of water. A few drops of mercury are then rubbed over its surface, thus coating it with a bright metallic film of zinc amalgam. Care must be taken not to use too much mercury, since the zinc plate would thus be rendered brittle.

**Zinc-Carbon Voltaic Cell.**—(See *Cell, Voltaic, Zinc-Carbon*.)

**Zinc-Copper Voltaic Cell.**—(See *Cell, Voltaic, Zinc-Copper*.)

**Zinc, Crow-Foot** — — A crow-foot-shaped zinc used in the gravity voltaic cell. (See *Cell, Voltaic, Gravity*.)

The term "crow-foot" refers to the shape of the claws. It is hardly a happy term.

**Zinc-Lead Voltaic Cell.**—(See *Cell, Voltaic, Zinc-Lead*.)

**Zinc Sender.**—(See *Sender, Zinc*.)

**Zincode of Voltaic Cell.**—A term formerly employed to indicate the zinc terminal or electrode of a voltaic cell.

The negative electrode or kathode are preferable terms.

**Zone, Anoelectrotonic** — — A name sometimes given to the polar zone. (See *Zone, Polar*.)

**Zone, Kathoelectrotonic** — — A name sometimes given to the peripolar zone. (See *Zone, Peripolar*.)

**Zone, Peripolar** — — A term proposed by De Watteville for the zone or region surrounding the polar zone on the body of a patient undergoing electro-therapeutic treatment.

**Zone, Polar** — — A term proposed by De Watteville for the zone or region surrounding the therapeutic electrode applied to the human body for electric treatment.

# APPENDIX.

*References to Words, Terms and Phrases which appear in the Appendix are preceded by the words "See Appendix"; all other references apply to the main portion of the Dictionary.*

## A

**A.**—A symbol proposed for ampère, the practical unit of electric current.

**a.**—A symbol proposed but not adopted for acceleration.

The defining equation is  $a = \frac{V}{T}$

This letter is sometimes, though rarely, employed as the symbol for ampère.

**$\alpha$ .**—A symbol proposed for angle expressed in circular measure.

The defining equation is  $\alpha = \frac{\text{arc}}{\text{radius}}$

**A. h.**—An abbreviation used for ampère hour, a commercial unit of electric quantity.

**A. t.**—An abbreviation for ampère-turn, a practical unit of magneto-motive force.

**Abscissae.**—Plural of abscissa.

**Absorptive.**—Possessing the power of absorption. (See *Absorption*.)

**Acceleration, Angular** — — The time rate of change of angular velocity.

**Accumulation Method for Testing Joints in Electric Cables.**—(See *Appendix—Method, Accumulation, for Testing Joints in Electric Cables*.)

**Accumulator, Bi-Metallic** — — A term applied to a secondary or storage cell in which two different metallic substances are employed in connection with a single elec-

trolytic fluid composed of a solution of a salt of one of the metals of the plates.

Many different bi-metallic accumulators have been designed; for example, the copper-lead accumulator, in which plates of copper and lead are immersed in an electrolyte of copper sulphate; or the copper-zinc accumulator, in which plates of zinc and copper are immersed in an electrolyte of zinc sulphate; or the zinc-lead accumulator, in which plates of zinc and lead are immersed in an electrolyte of zinc sulphate.

**Accumulator, Charge** — — A term sometimes employed for a Leyden jar or condenser. (See *Jar, Leyden. Condenser*.)

**Accumulator, Copper-Lead** — — An electro-chemical or electrolytic accumulator consisting of plates of copper and lead immersed in a solution of copper sulphate.

**Accumulator, Copper-Zinc** — — An electro-chemical or electrolytic accumulator consisting of plates of copper and zinc immersed in a solution of zinc sulphate.

**Accumulator, Current** — — A term sometimes employed for a Barlow wheel when used as an electrical accumulator. (See *Accumulator*.)

A series-wound dynamo-electric machine constitutes in reality a current accumulator.

**Accumulator, Electro-Chemical** — —

The name generally given to the ordinary secondary or storage battery, in which the difference of potential is produced by chemical action. (See *Cell, Storage*.)

**Accumulator, Electrolytic** — — An electro-chemical accumulator. (See Appendix—*Accumulator, Electro-Chemical*.)

**Accumulator, Storage** — — A term sometimes employed for storage cell. (See *Cell, Storage*.)

**Accumulator, Zinc-Lead** — — An electrolytic accumulator consisting of plates of zinc and lead immersed in a solution of zinc sulphate.

**Acoustic Interference**.—(See Appendix—*Interference, Acoustic*.)

**Acoustic Resonance**.—(See Appendix—*Resonance, Acoustic*.)

**Acoustic Telegraph**.—(See Appendix—*Telegraph, Acoustic*.)

**Actinometer**.—An instrument devised to measure the relative intensity of the sun's rays, or of such artificial light as the electric light, etc., etc.

The actinic power of the sun's rays to cause chemical decomposition varies with the condition of the atmosphere and the position of the sun above the horizon.

**Action, Gyrostatic, of Dynamos on Ship-board** — — The action which occurs at the bearings of a dynamo running on board a tossing ship, whereby gyrostatic stresses are set up.

**Action, Protective** — — A term proposed for the protective action afforded by a magnetic field to paramagnetic metals when exposed to chemical action.

The proposed term is not good in view of the fact that it is used to cover a number of other kinds of protective actions.

Experiments as to the protective action of a magnetic field on iron, nickel and cobalt were undertaken by Prof. Rowland and Dr. Bell. The results of these experiments, as stated by the experimenters, are as follows:

"When the magnetic metals are exposed to action in a magnetic field, such action is decreased or arrested at any points where the ratio of the variation of the square of the magnetic force tends towards a maximum."

The results obtained by Rowland and Bell were apparently at variance with some more recent experiments of Squier, and showed that the currents produced by couples of similar metals when exposed to chemical action in a magnetic field had a direction of flow through the liquid from the magnetized to the non-magnetized electrode—i. e., in the opposite direction to that pointed out by Squier in the phenomena of the protective throw. (See Appendix—*Throw, Protective*.)

**Adielectric**.—A term proposed for substances that are not dielectrics, that is, substances whose electric conductivity at ordinary temperatures decreases as the temperature increases.

**Adjustable Rheostat**.—(See Appendix—*Rheostat, Adjustable*.)

**Aelotropic**.—Heterogeneous with respect to direction.

**Aelotropic Medium**.—(See Appendix—*Medium, Aelotropic*.)

**After-Working of Dielectric**.—(See Appendix—*Dielectric, After-Working of*.)

**Age-Coating of Chamber of Incandescent Electric Lamp**.—(See Appendix—*Chamber of Incandescent Electric Lamp, Age-Coating of*.)

**Ageing of Incandescent Electric Lamp**.—(See Appendix—*Lamp, Incandescent Electric, Ageing of*.)

**Agglomerate Leclanché Voltaic Cell**.—(See Appendix—*Cell, Voltaic, Agglomerate Leclanché*.)

**Air Telegraphy**.—(See Appendix—*Telegraphy, Air*.)

**Alarm, Frost** — — An alarm sounded or set in operation by means of mechanism operated by a fall of temperature to or below 32° F.

**Alarm, Photo-Electric** — — A selenium



cell proposed for use in connection with the circuit of an electric source and suitable electro-receptive devices, so as to permit the passage of a stronger current through the circuit and the consequent sounding of an alarm on the exposure of one of its faces to the light.

By means of this device a burglar, carrying a light, can be made automatically to ring an alarm bell, and thus call the attention of a watchman or policeman to his presence.

**Allotropy.**—Allotropy. (See *Allotropy*.)

**Alternating Current Arc.**—(See Appendix—*Arc, Alternating Current*.)

**Alternating Current Potentiometer.**—(See Appendix—*Potentiometer, Alternating Current*.)

**Alternating Current Rotary Transformer.**—(See Appendix—*Transformer, Alternating Current Rotary*.)

**Alternating Electromotive Force.**—(See Appendix—*Force, Electromotive, Alternating*.)

**Alternation, Periodicity of** — —The number of alternations per second produced by a generator.

The term periodicity of alternation is synonymous with frequency, a briefer and more commonly employed word.

When any particular periodicity or frequency is spoken of, as, for example, 250 alternations per second, 125 complete periods or cycles per second are meant.

Commercially, the word alternations is used for half-periods or double-frequencies. A dynamo with 250 alternations per second has 125 periods per second.

**Alternations, Co-phasal** — —Alternations whose electromotive forces similarly and simultaneously vary.

The maximum and minimum electromotive forces of co-phasal alternations are both simultaneously and similarly directed.

Any number of periodic functions are said

to be co-phasal when the ratio between their instantaneous values is constant; when one is a maximum all the remainder will be maxima, and when one is a minimum all the remainder will be minima.

**Alternator, Compensated** — —An alternating current dynamo-electric machine for sustaining a uniform voltage at some point of its circuit under varying loads, in which the field magnets are excited partly by rectified or commuted currents taken from separate armature coils, and partly by currents furnished by the commuted current from a small transformer, whose primary coil is placed in the main circuit.

**Alternator, Compound** — —An alternating current dynamo-electric machine whose field magnets are compound-wound.

The current from the machine is commonly run through a series transformer whose secondary winding is connected with the field magnets through a commutator.

**Alternator, Magnetic** — —An alternating dynamo-electric machine in which permanent field magnets are employed.

**Alternator, Magneto** — —A term sometimes employed for magnetic alternator. (See Appendix—*Alternator, Magnetic*.)

**Alternator, Multiphase** — —An alternating current dynamo capable of producing multiphase currents.

**Alternator, Separate-Coil** — —An alternating current dynamo-electric machine in which the field magnets are excited by means of current taken from the coils on the armature, which current is first rectified, or caused to flow in one and the same direction, by means of a commutator.

**Alternator, Separately-Excited** — —An alternating current dynamo-electric machine in which the field magnets are excited by means of current furnished from a separate source.

**Alternator, Two-Phase** — — An alternating current dynamo capable of producing two-phase currents.

The term di-phase alternator would appear to be preferable.

**Alternators, Parallel Connection of** — —  
—The connection of two or more alternating current dynamo-electric machines in parallel, so as to form a single electric source.

When two alternating current dynamo-electric machines are connected in parallel, if the armature self-induction and resistance are not too high, and the engines driving the dynamos are under control, or in other words governed, then such machines, even if out of synchronism, when connected, will almost immediately pull each other into synchronism, each promptly exercising an automatic control over the other.

When alternators possess marked synchronizing power, care must be exercised to adjust them fairly to equality of E. M. F. and phase, in order that they may not be injured by mechanical shock due to excessive cross currents, when first connected in parallel. A certain amount of armature self-induction is therefore desirable to render parallel working safe.

It is a matter of prime importance in the parallel running of alternators that the shape of the wave of E. M. F. is the same in all machines. Otherwise cross currents will flow between the machines under all adjustments. A difficulty is occasionally experienced in the parallel connection of alternators of different size, due to differing wave form.

**Alternators, Parallel, Hunting of** — —  
A periodical increase and decrease in the speed of alternators when running in parallel connection as motors or as dynamos under certain conditions.

**Alternators, Series Connection of** — —  
The connection of two or more alternating current dynamo-electric machines in series, so as to form a single electric source.

The series connection of alternating dynamo-electric machines is impracticable in or-

dinary work; for, should such connection be made when the two machines are furnishing currents in the same phase, as soon as either machine differs in the slightest degree in phase from the other such difference would tend to rapidly increase, until the two machines were in opposite phases, when, of course, no current would be produced. Hence, alternators can be run in series only when their armatures are mechanically and rigidly connected with each other.

**Amalgamating Solution.**—(See Appendix—*Solution, Amalgamating.*)

**Amalgamator, Electric** — — Any apparatus for the electrical treatment of gold or silver ores with mercury.

An electric amalgamator consists essentially of an amalgamator driven by electric instead of by ordinary mechanical power.

**American Morse Code.** (See Appendix—*Code, American Morse.*)

**Ammeter, Steel-Yard** — — A form of ammeter in which the strength of the current is measured by means of the electromagnetic forces applied to one extremity of a steel-yard lever provided with sliding weights for balancing these forces.

**Ampère, B. A.** — — Such a current as would deposit 0.001118 gramme of silver per second from a neutral solution of nitrate of silver in distilled water.

This value of the ampère was adopted by the British Association at its meeting held in Edinburgh in August, 1892, the English Board of Trade, and by the Chicago Congress of 1893.

Equal to the international ampère.

**Ampère-Centimetre.**—A term proposed as a unit of magnetism.

The ampère-centimetre as a unit of magnetism is based on an assumption denied by some that any unit length of circuit, say one centimetre, conveying a unit current of one ampère, will generate a constant number of lines of magnetic force.

The proposed unit has not been accepted.

**Ampère, International** — — The value

of the international ampère adopted by the Chicago Congress of 1893 as equal to one-tenth of the unit of current of the C. G. S. system of electro-magnetic units, and which is represented sufficiently well for practical use by the unvarying current which when passed through a solution of nitrate of silver in water, and in accordance with certain specifications, deposits silver at the rate of 0.001118 of a gramme per second.

**Ampère Meter, Milli** — — An ampère meter, which measures in milli-amperes the current passing through it.

**Ampère Yards.** — (See Appendix—*Yards, Ampère.*)

**Anæsthesia.** — Insensibility, especially to pain.

**Anæsthesia, Electric** — — Nervous insensibility produced by means of electricity.

Local anæsthesia is obtained by means of induction apparatus in which the number of makes and breaks can be readily varied. It has been found in certain cases, when the makes and breaks follow one another with a given rapidity, which can be determined by means of the musical note produced, that such slight operations as the lancing of a felon can readily be performed without pain, after the part has been subjected to the action of the current for but a few minutes.

**Anemograph, Electric** — — An apparatus for electrically registering the direction and velocity of the wind.

**Angle of Maximum Sensitiveness of Galvanometer.** — (See Appendix—*Galvanometer, Angle of Maximum Sensitiveness of.*)

**Angle, Phase** — — The angle comprised between two different current maxima.

**Angular Acceleration.** — (See Appendix—*Acceleration, Angular.*)

**Annunciator, Speaking-Tube** — — An oral annunciator. (See *Annunciator, Oral.*)

**Annunciator, Swinging** — — A pendulum annunciator. (See *Annunciator, Pendulum.*)

**Annunciator Wire.** — (See Appendix—*Wire, Annunciator.*)

**Anodic Rays of Vacuum Tube.** — (See Appendix—*Rays, Anodic, of Vacuum Tube.*)

**Anomalous Helix.** — (See Appendix—*Helix, Anomalous.*)

**Anomalous Solenoid.** — (See Appendix—*Solenoid, Anomalous.*)

**Anomalous Spiral.** — (See Appendix—*Spiral, Anomalous.*)

**Anti-Node.** — The point on a vibrating body midway between two successive nodes. (See Appendix—*Node.*)

The point of maximum motion in a vibrating body.

**Apparatus, Individual Signalling** — — Any apparatus by means of which individual signals are operated. (See Appendix—*Signal, Individual.*)

Lockwood arranges the different methods according to which individual signals can be operated under the following heads, namely:

- (1.) Signals operated at each sub-station or circuit with different strengths of current.
- (2.) Signals operated by currents of opposed direction.
- (3.) Signals operated both by changes in the strength and direction of the current.
- (4.) Electro-magnetic step-by-step devices, acting to bring the sub-station signals to a ringing point differing for each sub-station, and then to close a local branch or shunt circuit, including a local bell, to operate alternating mechanism, or in some way to introduce a bell magnet into the circuit.

(5.) Signals operated by means of various arrangements of clockwork bells.

(6.) Signals operated by means of galvanometers, the movements of whose needles cause bells to ring.

To which may be added, signals operated by currents of different periodicity.

**Apparatus, Polyphase** — — Apparatus

operated by polyphase currents. (See Appendix—*Currents, Polyphase.*)

**Apparatus, Selective Signalling** — — A term sometimes used in place of individual signalling apparatus. (See Appendix—*Apparatus, Individual Signalling.*)

**Apparent Resistance.**—(See Appendix—*Resistance, Apparent.*)

**Arc, Alternating Current** — — An arc formed by means of an alternating current.

Since in the alternating current the electrodes become alternately positive and negative, neither carbon in the case of a carbon arc is markedly brighter than the other, and the rate of consumption of both carbons is the same.

**Arc, Carbon** — — A voltaic arc formed between two carbon electrodes.

The carbon voltaic arc is the one ordinarily employed, and is formed through a cloud of volatilized carbon. (See *Arc, Voltaic.*)

**Arc, Common, of Aurora Glory** — — The inner or common arc of an aurora glory. (See Appendix—*Glory, Aurora.*)

**Arc, Continuous Current** — — A voltaic arc produced by means of a continuous electric current.

In a continuous current arc the light is principally emitted from a crater in the positive carbon.

**Arc, Copper** — — A voltaic arc formed between two copper electrodes.

A copper arc is formed through a cloud of volatilized copper. Most metallic arcs are longer than carbon arcs. They possess the characteristic color of the volatilized metal; for example, the copper arc is green. (See *Arc, Voltaic.*)

A copper or other metallic arc would be formed from copper or other metallic rod if it formed the positive electrode, and a block of carbon or other non-metallic substance formed the negative electrode, since it is the material of the positive electrode that is volatilized.

**Arc Lighting Dynamo-Electric Machine.**

—(See Appendix—*Machine, Dynamo-Electric, Arc Lighting.*)

**Arc, Two Thousand Candle Power, Proposed Definition for** — — The light of an arc produced by 10 amperes of current and 45 volts potential difference between the carbons.

A 450-watt arc restricted as above.

Such an arc is sometimes called a full arc.

The difficulty in measuring the photometric intensity of a continuous current carbon arc is so great that considerable controversy has arisen as to whether or not a given candle power is present in certain cases. This difficulty arises not only from the fact that the light is of much greater intensity in certain directions than in others, but also from the fact that the candle power of an arc having a certain watt value may differ greatly with the quality of the carbons employed.

The adoption of the above definition would, therefore, seem to be extremely advisable.

**Armature, Balanced** — — An armature of an electro-magnet whose motion toward or from the magnetic poles is opposed by the pull of a spring, or the action of a weight, so that on the cessation of the magnetic attraction the armature will be caused to assume the position it had before the magnetic action began.

Strictly speaking, such an armature is not balanced; the term, however, is a convenient one.

**Armature, Balanced** — — An armature of a dynamo-electric machine so constructed or adjusted that the line joining the centres of inertia of all its cross sections practically coincides with the axis of rotation.

A balanced dynamo armature runs smoothly and without mechanical jars or vibrations.

**Armature, Balanced** — — An armature of a dynamo or motor in which the winding is such as to insure electrical symmetry.

**Armature, Coreless, of Dynamo or Motor**

— — An armature of a dynamo or motor



not provided with a core of iron or other magnetizable material.

**Armature, Di-Phase** — — An armature of a motor wound so as to be operated by di-phase currents.

**Armature, Magnetic Sticking of** — — The adherence of the armature of an electro-magnet to the poles, after the current has ceased to pass through the magnetizing coils.

The cause of sticking is to be ascribed to the residual magnetism.

Sticking is sometimes avoided by means of core pins, or by a non-magnetizable coating of armature or core. (See Appendix—*Pins, Core.*)

**Armature, Polyphase** — — An armature of a motor wound so as to be operated by polyphase currents.

**Armature Reaction.**—(See Appendix—*Reaction, Armature.*)

**Armature, Three-Phase** — — A tri-phase armature. (See Appendix—*Armature, Tri-Phase.*)

The term tri-phase armature would appear to be preferable.

**Armature, Tri-Phase** — — An armature of a motor wound so as to be operated by tri-phase currents.

**Armature, Two-Phase** — — A di-phase armature. (See Appendix—*Armature, Di-Phase.*)

The term di-phase armature would appear to be preferable.

**Arms, Slide** — — A term applied to the supports for the bearings of railway motors.

**Arrival Curve of Telegraphic Circuit.**—(See Appendix—*Curve, Arrival, of Telegraphic Circuit.*)

**Arriving Current of Telegraphic Circuit.**—See Appendix—*Current, Arriving, of Telegraphic Circuit.*)

**Asbestos-Porcelain.**—A porous substance somewhat resembling ordinary porcelain.

Asbestos-porcelain is made by obtaining asbestos fibres in an exceedingly fine powder and forming this powder into a paste with water, consolidating it under heavy pressure, and subsequently exposing the dried particles to the effects of a high temperature.

Asbestos-porcelain, it is claimed, forms a material which, though resembling ordinary porcelain, is highly porous. It has been successfully used for the porous cells of voltaic batteries, for which purposes it is claimed to offer a better conducting path for the current than the ordinary unglazed earthenware generally employed for such purposes. (See *Cells, Porous.*)

**Astatic Multiplier.**—(See Appendix—*Multiplier, Astatic.*)

**Atmosphere, Electric** — — A term formerly employed for a space filled with electric effluvia. (See Appendix—*Effluvia, Electric.*)

A term sometimes employed for an electro-static field.

A space occupied by or permeated with electric sparks or glow.

**Atmosphere, Magnetic** — — A term formerly employed for a space filled with magnetic effluvia. (See Appendix—*Effluvia, Magnetic.*)

A term sometimes employed for a magnetic field.

**Atom, Dyad** — — An atom whose valency, atomicity or combining power is two. (See *Atomicity. Element.*)

**Atom, Heptad** — — An atom whose valency or atomicity is seven. (See *Atomicity. Element.*)

**Atom, Hexad** — — An atom whose valency or atomicity is six. (See *Atomicity. Element.*)

**Atom, Monad** — — An atom whose valency or atomicity is one. (See *Atomicity. Element.*)

**Atom, Pentad** — — An atom whose valency or atomicity is five. (See *Atomicity. Element.*)



**Atom, Tetrad** — —An atom whose valency or atomicity is four. (See *Atomicity Element*.)

**Atom, Triad** — —An atom whose valency or atomicity is three. (See *Atomicity Element*.)

**Atomic**—Of or pertaining to the atom. (See *Atom*.)

**Attachment, Electric Clamp** — —A device employed in connection with a floor push, adapted for ready clamping to a table or other support for the purpose of holding a push button electrically connected with the floor push.

**Attachment Plug**.—(See Appendix—*Plug, Attachment*.)

**Audible Telegraphic Signal**.—(See Appendix—*Signal, Telegraphic, Audible*.)

**Audiometer**.—A word sometimes used in place of Sonometer. (See Appendix—*Sonometer*.)

**Aura, Electric** — —A term formerly employed for the breeze produced by electric convection. (See *Convection, Electric*.)

**Aurora, Electrostatic** — —A luminous phenomenon attending the production of an electrostatic corona. (See Appendix—*Corona, Electrostatic*.)

**Aurora Glory**.—(See Appendix—*Glory, Aurora*.)

**Aurora, Polar** — —A term sometimes used indifferently for the aurora borealis, or the aurora australis.

**Austral Fluid**.—(See Appendix—*Fluid, Austral*.)

**Auto-Exciting**.—Self-exciting.

**Auto-Induction**.—(See Appendix—*Induction, Auto*.)

**Automatic Guard for Series-Connected Incandescent Lamps**.—(See Appendix—*Guard, Automatic, for Series-Connected Incandescent Lamps*.)

**Automatic Photo-Electric Switch**.—(See Appendix—*Switch, Automatic Photo-Electric*.)

**Automatic Repeater**.—(See Appendix—*Repeater, Automatic*.)

**Automatic Telegraph**.—(See *Telegraph, Automatic*.)

**Automatic Telegraphic Transmitter**.—(See Appendix—*Transmitter, Automatic Telegraphic*.)

**Auto-Reversible or Multiple Tele-Radiophone**.—(See Appendix—*Tele-Radiophone, Auto-Reversible or Multiple*.)

**Axial Current**.—(See Appendix—*Current, Axial*.)

## B

**B**—A symbol employed for magnetic induction.

The defining equation is  $B = \mu H$

**B. A. Ampere**.—(See Appendix—*Ampere, B. A.*)

**B. A. Ohm**.—(See *Ohm, B. A.*) (See Appendix—*Ohm, B. A.*)

**B. T. U.**—A contraction for Board of Trade unit, the commercial unit of electrical work adopted by the British Board of

Trade, viz., the kilowatt-hour, or the amount of work which would be accomplished in one hour at the rate of one kilowatt.

This contraction is a bad one, since it is already employed for British thermal unit.

**B. T. U.**—A contraction for British thermal unit.

**Back Magnetization**.—(See Appendix—*Magnetization, Back*.)

**Backing Pan**.—(See Appendix—*Pan, Backing*.)

**Backward Induction of Dynamo Armature.**—(See Appendix—*Induction, Backward, of Dynamo Armature.*)

**Bad Earth.**—(See Appendix—*Earth, Bad.*)

**Balance, Coulomb's Electric** — — A term sometimes employed for Coulomb's torsion balance when used for measuring the force of electric repulsion. (See *Balance, Coulomb's Torsion.*)

**Balance, Coulomb's Magnetic Torsion** — — A name sometimes given to Coulomb's torsion balance when employed to measure the force of magnetic repulsion. (See *Balance, Coulomb's Torsion.*)

**Balance, Duplex** — — The condition of a line in duplex telegraphy, when sending signals leave the home instruments unaffected and ready for response to received signals.

**Balance, Electro-Dynamic** — — A balance form of electro-dynamometer. (See *Dynamometer, Electro. Balance, Centi-Ampère.*)

**Balanced Armature.** — (See Appendix—*Armature, Balanced.*)

**Balancing Wire or Conductor.**—(See Appendix—*Wire or Conductor, Balancing.*)

**Barker's Revolving Contact Breaker.**—(See Appendix—*Breaker, Contact, Barker's Revolving.*)

**Barker's Wheel.**—(See Appendix—*Wheel, Barker's.*)

**Base, Socket** — — A base for holding a lamp socket in position.

**Basket, Dipping** — — A perforated basket of non-corrosive material, employed for the reception of articles that are to be prepared for the process of electroplating by dipping them in the cleansing bath. (See *Dipping.*)

**Basket, Stoneware Dipping** — — A stoneware basket in which the articles are

placed that are to be subjected to the dipping process in electro-metallurgy. (See Appendix—*Basket, Dipping.*)

**Bath, Electric Light** — — A variety of electro-therapeutic bath, in which all the patient's body, except the head, is exposed to the radiant light and heat of a number of incandescent electric lamps placed inside a closed chamber or box.

By the use of the electric light bath it is claimed that the temperature of the body is rapidly increased, and that the effect on the skin is the same as that of sunshine. The therapeutic value of such a bath is, perhaps, to be questioned.

**Battery, Compound** — — A term proposed by Henry for a number of separate voltaic cells, coupled so as to form a single cell, in contradistinction to a single cell.

The term battery was originally sometimes loosely applied either to indicate a single voltaic cell, or a number of cells so joined together as to form a single electric source.

Indeed, the term is still loosely employed even at the present day by some writers. In the time of Henry the word battery was apparently indifferently applied to a single cell or a number of cells, and Henry proposed the term compound battery to distinguish between a single cell, or, as he called it, a battery, and a number of cells joined so as to form a single source, which he terms a compound battery, but which is to-day, by all careful writers, termed a battery.

**Battery, Distant** — — A battery employed in a telegraphic system at the receiving end of the line.

**Battery, Dry** — — A number of separate dry voltaic cells combined so as to act as a single source.

A dry pile. (See *Pile, Dry.*)

**Battery, Element of** — — (See Appendix—*Element of Battery.*)

**Battery, Home** — — The battery employed in a telegraphic system at the sending end of the line.

**Battery, Polarization** — — A term sometimes employed for a secondary or storage battery.

The term secondary or storage battery would appear to be preferable.

**Battery, Secondary, Current Efficiency of** — — The ratio between the ampère-hours of the discharge and the ampère-hours of the charge.

**Battery, Secondary, Efficiency of** — — The ratio between the amount of electrical work given out by a battery during its discharge, and the amount of work expended in charging it.

The efficiency of a secondary battery varies with the rates of charge and discharge; the higher these rates the lower the efficiency.

The efficiency of a secondary battery is obtained by dividing the amount of electrical work in joules or watt-hours, which a battery will produce after being charged, by the amount of similarly estimated electrical work expended in charging it. This is generally known as the watt-efficiency.

The current-efficiency is obtained by dividing the ampère-hours of the discharge by the ampère-hours of the charge.

**Battery, Secondary, Watt-Efficiency of** — — The ratio between the amount of electrical work in watt-hours a battery will yield after being charged, and the amount of work in watt-hours expended in charging it.

**Battery Syringe.**—(See Appendix—*Syringe, Battery.*)

**Battery System for Electric Railway.**—(See Appendix—*Railway, Electric, Battery System for.*)

**Bead, Chain.**—(See Appendix—*Chain, Bead.*)

**Bead Lightning.**—(See Appendix—*Lightning, Bead.*)

**Bearing, Magnetic** — — The angle included between the horizontal line from an observer to an object and the observer's magnetic meridian.

**Bega.**—A prefix proposed by Houston and Kennelly for a thousand million, or  $10^9$ .

**Begadyne.**—A term proposed by Houston and Kennelly for one thousand million dynes, or  $10^9$  dynes.

**Begerg.**—A term proposed by Houston and Kennelly for one thousand million ergs, or  $10^9$  ergs.

**Beginning of Current.**—(See Appendix—*Current, Beginning of.*)

**Begohm.**—A term proposed by Houston and Kennelly for one thousand million ohms; i. e.,  $10^9$  ohms.

**Bell, Electric, Continuous Action** — — An electric bell which continues to ring when once started until stopped either by hand or automatically.

**Bell, Extension** — — A term sometimes employed for extension call bell. (See *Bell, Extension Call.*)

**Belt, Creeping of** — — An action of a belt due to its retractility, whereby the driving pulley travels somewhat faster than the driven pulley.

Suppose the belt possesses true elasticity or retractile power, then it will be stretched on the work side and come back to its original length on the idle side. It therefore reaches the driving pulley in a stretched condition and leaves it in a contracted condition. It also reaches the driven pulley in a contracted condition and leaves it in an elongated condition. Suppose this stretch or elongation is one per cent. in a given case, the driving pulley must move 101 feet for every 100 feet of the driven pulley, then there is no slip of the belt, only a creep.

The slip of a belt may cause a considerable loss of peripheral velocity in the pulley.

**Belt, Slipping of** — — The slipping of a belt on the revolving pulley it covers, causing a loss of speed.

**Biero.**—A prefix proposed by Houston and Kennelly denoting the thousand-millionth part, or  $10^{-9}$ .

**Microfarad.**—A term proposed by Houston and Kennelly for the thousandth part of a microfarad, or  $10^{-9}$  farad.

**Microhenry.**—A term proposed by Houston and Kennelly for the thousand-millionth part of a henry, or one centimetre.

**Bi-Metallic Accumulator.**—(See Appendix—*Accumulator, Bi-Metallic.*)

**Biologist, Electro** — — One skilled in the art of electro-biology.

**Bioscopist, Electro** — — One skilled in the science of electro-bioscopy.

**Blavier's Formula.**—(See Appendix—*Formula, Blavier's.*)

**Blavier's Test.**—(See Appendix—*Test, Blavier's.*)

**Block, Ceiling** — — An attachment fastened to ceilings for suspending flexible cords and connecting them with the supply wires of an incandescent system.

**Block, Double, Duplex** — — In telegraphy, especially in submarine telegraphy, duplex transmission obtained by the aid of a condenser inserted in each arm of the Wheatstone balance. (See *Telegraphy, Duplex, Bridge Method of.*)

**Block, Service** — — The set of terminals from which service wires are taken to the interior of a building, usually secured to a pole or to the exterior of a building.

**Blow, To** — — A phrase frequently employed to indicate the fusion of a safety fuse. (See *Fuse, Safety.*)

**Blowing of Fuse.**—(See Appendix—*Fuse, Blowing of.*)

**Blowing Point of Fuse.**—(See Appendix—*Fuse, Blowing Point of.*)

**Blue Magnetic Pole.**—(See Appendix—*Pole, Magnetic, Blue*)

**Board, Distributing** — — A term sometimes employed in a system of telegraphic or telephonic communication for a cross connecting board. (See *Board, Cross-Connecting.*)

**Board, Distributing Switch** — — A switch board employed for distributing electric current to different circuits.

A distributing switch board is usually provided with wedge-plugs and spring-jacks.

**Board, Lightning Arrester** — — In a system of telephonic or telegraphic communication the board to which the lightning arrester is connected.

The lightning arrester board often forms part of the test-board.

**Board, Test** — — In a system of telephonic or telegraphic communication the board, provided with devices for readily connecting testing instruments to any particular line, to which all the separate lines are connected.

**Bob, Polishing** — — A disc of hard, tough wood, provided on its edge with a ring or rim of tough leather or hide, and employed, when mounted on a shaft and put into rapid rotation, for polishing articles so as to prepare them for electroplating. (See *Plating, Electro.*)

The polishing bobs are charged for use with any suitable abrasive material, such as emery, etc.

**Bobbed.**—A word sometimes employed to characterize a surface that has been polished by the action of a bob. (See Appendix—*Bob, Polishing.*)

**Body, Inductuous** — — A term proposed by Faraday for a body in which a charge is induced by the action of a neighboring charged body.

**Body, Inductive** — — A term proposed by Faraday for the body containing the inducing electric charge.

**Bolognian Stone.**—(See Appendix—*Stone, Bolognian.*)

**Bond, Electric Rail** — — An electric bond or connection between contiguous rails of a road using a grounded return.

In a system of electric roads, where the return circuit is grounded, the track offers an



excellent return provided the return joints between contiguous rails are electrically connected. To do this thoroughly, requires, of course, such an electric connection as will render the bonds of no higher linear resistance than the main body of the rails.

**Bony Current.**—(See Appendix—*Current, Bony.*)

**Booster.**—A scarcely euphonious word employed to designate a dynamo inserted in a special feeder or group of feeders of an Edison incandescent system in order to raise the pressure above the rest of the system.

**Boreal Fluid.**—(See Appendix—*Fluid, Boreal.*)

**Bougie-Metre.**—A name proposed for the practical unit of illumination.

A unit of illumination equal to the normal illumination from the bougie-decimale at a distance of one metre.

This unit was proposed by a Sub-Committee of the American Institute of Electrical Engineers on the provisional programme of the Chicago International Electrical Congress of 1893, on the occasion of the World's Columbian Exposition.

The bougie-decimale is practically equal to one English standard candle. By making the distance equal to one metre, the practical unit of illumination will be approximately equal to  $\frac{1}{10}$  carcel-metre, or one metre-candle, or to one metre-kerze.

**Bow, Voltaic** — — A voltaic arc. (See *Arc, Voltaic.*)

**Bowl, Stoneware Dipping** — — A perforated bowl made of stone or earthen ware in which articles are placed that are to be subjected to the dipping process in electro-metallurgy. (See *Dipping.*)

**Box, Section** — — In a system of electric street railways the box containing the section switches and fuses used for the control of a section or a line section.

**Box, Starting, of Shunt-Wound Motor**

— — A box provided with a rheostat or variable resistance.

The armature resistance of a shunt-wound motor is generally made very low, in order to insure high efficiency and constancy of speed. In starting the motor, if it is connected to the constant potential circuit and the driving current be permitted to pass directly through its armature, the rush of current would be sufficient to injure the machine. To avoid this the current is first sent through a rheostat, or starting box, and, when the speed of the motor is sufficiently high, and a suitable counter-electromotive force is generated in the armature, the resistance coils are gradually cut out until the motor is connected directly to the constant potential mains.

**Branched Series.**—(See Appendix—*Series, Branched.*)

**Break Key.**—(See Appendix—*Key, Break.*)

**Break, Quick** — — A break of a circuit obtained by means of a quick-break switch. (See Appendix—*Switch, Quick-Break.*)

**Breaker, Contact** — — Any device for opening or breaking an electric circuit.

**Breaker, Contact, Barker's Revolving** — — A form of contact breaker in which a toothed wheel is rapidly revolved so that its teeth pass successively into and out of a mercury surface, and a rapid making and breaking of an electric circuit connected therewith is thus obtained.

**Breaking Down of Dielectric.**—(See Appendix—*Dielectric, Breaking Down of.*)

**Bridge, Thomson's** — — A modified form of Wheatstone's bridge proposed by Kelvin for the measurement of very small resistances.

**Broiler, Electric** — — A device for broiling by means of electrically generated heat.

Rods of insulated metal are suitably connected in parallel, and raised to incandescence



by means of electrically generated heat. (See *Heat, Electric*.)

In one form of apparatus made, when a potential difference of 110 volts is applied to the terminals, a current of seven amperes passes and heats the broiler sufficiently for use in about three or four minutes.

**Brush, Cup** — —A brush employed in cleansing surfaces that are to be prepared for electro-plating, and suitably shaped for polishing the inside of a cup or other similar hollow surface.

**Brush, Inside Box** — —A brush employed in cleansing surfaces so as to prepare them for electro-plating, suitably shaped for polishing the inside of tubular surfaces.

**Brush, Potash** — —A brush employed in cleansing, by the use of a caustic, surfaces that are to be electro-plated.

**Brush, Thimble** — —A brush employed in cleansing articles that are to be prepared for electro-plating, and suitably shaped for such surfaces as the inside of a thimble.

**Brushes, Distributing, of Electric Motor** — —The brushes of an electric motor corresponding in position to the collecting brushes of a dynamo-electric machine.

It is evident that the brushes of an electric motor differ somewhat in their function from the collecting brushes of a dynamo-electric machine, since in the former case the brushes act to distribute a current generated outside the motor to certain coils on the armature of the motor, while in the latter case they commute the direction of the current generated in the armature.

**Brushes, Finishing** — —A term employed in electro-plating for finer brushes than scratch brushes.

**Bucking**. A word employed in the operation of street railway passenger cars for the sudden stopping of a car, as if by a collision.

The car sometimes refuses to go further; it often, however, stops and then goes ahead again almost immediately as if nothing had occurred. The cause of bucking is to be ascribed to the fact that the armature being grounded, if a second ground occurs in any part of the machine, between the armature and the trolley, with the ordinary method of connecting up, a heavy current flows, producing an intensely strong magnetic field and at the same time the armature is short circuited by means of the two ground connections. Under these circumstances the dynamo, being short circuited, operates as a powerful electro-magnetic brake. This effect also occurs when the armature is short-circuited by heavy sparking at the brushes, or bad insulation (not to ground) in the commutator.

The term bucking is sometimes used loosely for any cause which prevents an electric motor from properly operating.

**Buffing**.—Preparing surfaces for the reception of an electro-plating by subjecting them to the polishing action of a revolving wheel covered with a buff on the surface of which rouge has been spread.

**Building Iron**.—(See Appendix—*Iron, Building*.)

**Building Process for Moulds of Electro-types**.—(See Appendix—*Process, Building, for Moulds of Electrotypes*.)

**Buoy, Electrically Illumined** — —A buoy illumined by means of an electric incandescent lamp.

The electric buoys are connected with the generating station on the shore by means of heavily armored cables. Spar buoys have been successfully lighted by such means.

**Burglar Alarm Contacts**.—(See Appendix—*Contacts, Burglar Alarm*.)

**Burglar Alarm Matting**.—(See Appendix—*Matting, Burglar Alarm*.)

**Burglar Alarm Trap**.—(See Appendix—*Trap, Burglar Alarm*.)

**Burned-Out Incandescent Lamp**.—(See

Appendix—*Lamp, Burned-Out Incandescent.*)

**Burnishing.**—A word employed in electro-plating for a process by means of which surfaces are prepared for electro-plating by subjecting them to the action of burnishing tools.

The burnishing action consists essentially in smoothing and brightening a surface by crushing down the small inequalities of the surface. The burnishing action is not unlike the smoothing action of a hot iron in ironing.

**Button, Commutator-Press** — — — — A form of press button in which the current from a battery or other source is reversed

in direction to the current previously flowing from the ordinary signalling button.

**Button, Push, Double-Contact** — — — — A push button provided with two contacts.

**Button Repeater.**—(See Appendix—*Repeater, Button.*)

**Buzz.**—A verb expressive of the action of an electric bell when it fails to strike distinctly and only gives a sound something like that of a buzzer.

An electric bell will "buzz" if the contacts are out of proper adjustment, or if the current passing is too strong.

**By-Pass of Discharge.**—A term sometimes employed for alternative path. (See *Path, Alternative.*)

## C

**C.**—A symbol used for capacity.

The defining equation is  $C = \frac{Q}{E}$

The same symbol is also used for current.

**C.**—A symbol used for coulomb, the practical unit of electric quantity.

The same symbol is also used for current and proposed for capacity.

**cm.**—An abbreviation frequently employed for the centimetre, the C. G. S. unit of length.

**cm<sup>2</sup>.**—An abbreviation frequently employed for square centimetre, the C. G. S. unit of surface.

**cm<sup>3</sup>.**—An abbreviation frequently employed for cubic centimetre, the C. G. S. unit of volume.

**cm : s.**—An abbreviation frequently employed for centimetre per second, the C. G. S. unit of velocity.

**cm : s<sup>2</sup>.**—An abbreviation frequently employed for centimetre per second per second, the C. G. S. unit of acceleration.

**C<sup>2</sup> B Loss.**—(See Appendix—*Loss, C<sup>2</sup>R.*)

**Cable, Concentric** — — — — A cable provided with both a leading out and a return conductor, one forming a central core or conductor and the other an enclosing tubular conductor, suitably insulated from each other.

In a concentric cable the central conductor is heavily insulated and enclosed in a metallic tube which latter acts as a return conductor.

**Cable, Linear Capacity of** — — — — The quotient of the capacity of a cable by its length.

**Cable, Linear Insulation of** — — — — The product of the insulation resistance of a cable and its length.

The linear insulation is preferably measured in kilometre megohms, or mile megohms.

**Cage Protector for Lightning Discharges.**—(See Appendix—*Protector, Cage, for Lightning Discharges.*)

**Callan Voltaic Cell.**—(See Appendix—*Cell, Voltaic, Callan.*)

**Callan's Electro-Magnetic Repeater.**—(See Appendix—*Repeater, Electro-Magnetic, Callan's.*)

**Calorimetry.**—The science of measuring quantities of heat. (See *Calorimeter*.)

**Capacitance.**—A term analogous to resistance, proposed by Hospitalier for the true or specific capacity of a medium.

**Capacity for Heat, Mean Thermal** — — The mean thermal capacity for heat of a body between two stated temperatures is the quantity of heat required to raise it from the lower of these temperatures to the higher, divided by the difference of temperatures. (See *Heat, Specific*.)

**Capacity, Kilometric, of Cable** — — The capacity of a cable in microfarads per kilometre. (See *Cable, Electric*.)

**Capacity, Magneto-Inductive** — — A term sometimes employed for magnetic permeability. (See *Permeability, Magnetic*.) The word permeability is preferable.

**Capacity, Specific Dielectric** — — A term sometimes employed in place of specific inductive capacity. (See *Capacity, Specific Inductive*.)

**Carbon Arc.**—(See Appendix—*Arc, Carbon*.)

**Carbon Pencil.**—(See Appendix—*Pencil, Carbon*.)

**Carbons, Skew Adjustment of, in Arc Lamp** — — The adjustment of the carbons of an arc lamp by means of which the positive carbon is placed a short distance in front of, back and out of a vertical line with, the negative carbon.

The skew adjustment is employed in a projector or search light for the purpose of insuring the formation of the crater on the edge of the positive carbon so that the principal part of the light is thrown out horizontally.

**Cardan's Suspension of Compass Needle.**—(See Appendix—*Suspension of Compass Needle, Cardan's*.)

**Carrying Capacity of Safety Fuse.**—(See Appendix—*Fuse, Safety, Carrying Capacity of*.)

**Casting, Electric** — — A process for the casting of metals that have been fused by means of heat of electric origin.

The metals are fused by heat in a specially provided furnace from which all the air has been exhausted. The fused metal is then run into moulds from which the air has also been exhausted.

The vacuum and the electric melting, it is claimed, produce a greater liquidity of the metal than do the ordinary methods, and hence insure a readier flow and more sharply marked castings. The metal of the casting is also for the same reason extremely close and fine grained, and is free from blow-holes.

**Castor and Pollux Light.**—(See Appendix—*Light, Castor and Pollux*.)

**Cataphoric Electrode.**—(See Appendix—*Electrode, Cataphoric*.)

**Cataphoric Medication.**—(See Appendix—*Medication, Cataphoric*.)

**Ceiling Block.**—(See Appendix—*Block, Ceiling*.)

**Ceiling Rosette.**—(See Appendix—*Rosette, Ceiling*.)

**Cell, Double-Liquid** — — A term sometimes employed in place of double-fluid cell. (See *Cell, Voltaic, Double-Fluid*.)

**Cell, Dry Gelatine** — — A term applied to a type of dry voltaic cell in which the exciting liquid is absorbed by, or combined with, a variety of gelatinous substances.

The term gelatine dry cell is by no means limited to cases in which gelatine, either in whole or in part, forms the material for the retention of the exciting liquid. On the contrary, such cells most frequently contain a mixture of various mineral substances which on standing assume a gelatinous or semi-gelatinous condition from the water combining with the substances.

**Cell, Earth** — — A term frequently applied to a variety of cell consisting of any voltaic couple buried in a comparatively moist stratum of earth.

In such cases the moisture of the earth acts as the electrolyte and the electromotive forces developed depend on the character of the voltaic couples employed.

The term earth cell is sometimes improperly applied to the case of two similar metallic plates buried in the earth at considerable distances from one another. In such cases the current produced is obtained in part at least by means of the difference of potential caused between the two points of the earth at which the separate plates are located.

It is evident, however, that the current produced by such earth cells, improperly so-called, is in reality obtained from the earth as an electric source, the plates with their metallic terminals simply forming conductors for carrying off the current generated by the difference of potential already existing in the earth. (See *Currents, Earth*.)

**Cell, Galvanic** — — A term sometimes employed instead of voltaic cell. (See *Cell, Voltaic*.)

**Cell, Gas** — — A term sometimes applied to one of the cells of a gas battery. (See *Battery, Gas*.)

**Cell, Lead Sulphate of Copper** — — A form of storage cell in which two plates of lead are immersed in a solution of copper sulphate.

On the passage of the charging current one lead plate becomes coated with lead peroxide and the other with metallic copper. (See *Cell, Storage*.)

**Cell, Lead Sulphate of Zinc** — — A form of storage cell in which two plates of lead are immersed in a solution of zinc sulphate.

On the passage of the charging current one plate becomes coated with lead peroxide and the other with metallic zinc.

This cell, according to Reynier, has an electromotive force of as high as from 2.8 to 3.0 volts, but soon falls to from 2.3 to 2 volts. (See *Cell, Storage*.)

**Cell, Light** — — A term sometimes employed for a photo-electric cell. (See *Cell, Photo-Electric*.)

Radiant energy, whether of the luminous type, as in the case of light, or of the non-luminous type, as in the case of heat, produces a difference of potential under a variety of circumstances.

In some cases violet-colored light seems to produce the most marked effects.

Roughly speaking, photo-electric, or light cells, can be grouped into two fairly sharply marked classes, namely:

(1.) Those in which the electricity accompanies some chemical decomposition which acts to produce a current.

(2.) Those in which slight molecular changes occur which result in the production of an electric current.

The production of electricity in cells of the latter type, by the action of light alone, is probably analogous to the production of pyro-electricity in the case of certain crystalline bodies. (See *Electricity, Pyro*.)

**Cell, Magneto-Chemical** — — A cell invented by Balsamo, in which two similarly magnetized bars are immersed with the north pole of one and the south pole of the other in a solution of oxalic acid.

Under these circumstances the magnet having its north pole immersed in the exciting liquid acts like the zinc plate, and the one having its south pole like the copper of an ordinary zinc-copper couple immersed in dilute sulphuric acid.

The influence a magnetic fluid exerts on chemical action has been investigated by Rowland and Bell, and by Squier. (See *Appendix—Action, Protective, Throw, Protective, Throw, Concentration*.)

**Cell, Photo-Electric Impulsion** — — A term sometimes applied to an impulsion cell. (See *Cell, Impulsion*.)

**Cell, Primary** — — A term sometimes employed for a voltaic cell. (See *Cell, Voltaic*.)

The term primary cell is employed in contradistinction to secondary or storage cell. (See *Cell, Storage*.)

**Cell, Regenerative** — — A term proposed for an early form of storage or sec-



ondary cell, invented by Thomson and Houston, consisting of two plates of copper immersed in a solution of zinc sulphate.

Two plates were placed, one at the bottom of the solution, and the other near the top. On the passage of the charging current, one of the plates through the decomposition of the zinc sulphate was partially converted into copper sulphate and the other plate was coated with metallic zinc. The connections were such that the plate partially converted into zinc sulphate was placed at the bottom of the cell, and the one partially converted into and covered by metallic zinc, at the top.

The passage of the charging current thus produced a variety of gravity cell. On the exhaustion of the cell there remained two inert plates of copper immersed in a solution of zinc sulphate.

**Cell, Thermo-Chemical** — — A variety of heat cell in which a difference of potential is produced and maintained between two plates immersed in a suitable liquid when one plate is kept at a higher temperature than the other.

A heat cell forms in reality a species of storage battery in which the charging of the cell is obtained by the expenditure of heat energy.

In true heat cells a chemical action occurs which is readily and completely reversible by heat.

**Cell, Voltaic, Agglomerate Leclanché** — — A variety of Leclanché cell in which the mixture of carbon and dioxide of manganese is made into a solid mass by pressure.

The advantage claimed for the agglomerate Leclanché cell is that the porous cup employed in the other forms of this cell is dispensed with.

**Cell, Voltaic, Callan** — — A zinc-iron couple, the elements of which are immersed respectively in an electrolyte of dilute sulphuric acid, and an electrolyte consisting

of a mixture of strong nitric and sulphuric acids.

In the Callan cell the iron plays the part of the negative element. It is not attacked by the nitric acid provided the acid be sufficiently strong. The reasons generally assigned for the non-action of the acid on the iron are either the so-called passive state of the iron or the formation on the surface of an insoluble oxide. (See *State, Passive*.)

This cell is sometimes called the iron cell, or the Maynooth. It is difficult to maintain this cell in good action, owing to the liability of the nitric acid to act on the iron whenever its strength falls below a certain point.

**Cell, Voltaic, Heat** — — A cell in which heat energy is changed or converted into electric energy.

Park Benjamin divides heat cells into three classes, namely:

(1.) Those in which heat acts upon the materials of the cell by causing fusion or decomposition.

(2.) Those in which heat acts to set free chemical affinities whereby the cell is caused to operate, regeneration after exhaustion taking place at a lower temperature.

(3.) Thermo-chemical cells, or those in which the difference of potential is maintained between two plates immersed in a liquid by heating one plate to a higher temperature than the other.

**Cell, Voltaic, Maynooth** — — A name sometimes given to the Callan voltaic cell. (See Appendix—*Cell, Voltaic, Callan*.)

**Cell, Voltaic, Single-Liquid** — — A term sometimes employed in place of a single-fluid cell. (See *Cell, Voltaic, Single-Fluid*.)

**Cessation of Current**. — (See Appendix—*Current, Cessation of*.)

**Chain, Bead** — — A chain employed in connection with a pendant electric burner. (See *Burner, Plain Pendant Electric*.)

**Chain, Galvanic** — — A term formerly applied to a galvanic, or more properly



speaking, voltaic circuit. (See *Circuit, Voltaic*.)

**Chamber of Incandescent Electric Lamp, Age-Coating of** — The gradual darkening of the enclosing glass chamber of an incandescent electric lamp.

This coating may be due to a deposit of carbon or a hydrocarbon, or a deposit of metal deflagrated or volatilized by the heat of the filament.

**Charge Accumulator.**—(See Appendix—*Accumulator, Charge*.)

**Charge Current on Telegraphic Line.**—(See Appendix—*Line, Telegraphic, Charge Current on*.)

**Charge, Linear Density of** — The amount of electricity per unit of length of conductor. (See *Charge, Electric*.)

**Charge, Minus** — A negative charge. (See *Charge, Negative*.)

**Charge, Plus** — A positive charge. (See *Charge, Positive*.)

**Charge, Sweeping-Out** — A phrase employed in double-current signalling for the freeing of the line from a charge produced by the sending of one signal, by reversing the direction of the current through the line.

The "sweeping-out" of the charge on a telegraphic line decreases the amount of retardation. (See *Retardation*.)

**Charge, Volume Density of** — The amount of electricity per unit of volume. (See *Charge, Electric*.)

**Check, Telephone Time** — A device by means of which, in a telephone exchange system, a drop shutter is automatically released at a particular trunk wire indicator, at the beginning of the time that a subscriber is given the use of the trunk line, and automatically disconnected, and the central station operator's attention is called to the fact of such disconnection.

By the use of the time-check, disputes as

to the length of time a subscriber is given the use of a trunk line is avoided.

A telephone time-check is sometimes called a telephone meter. (See Appendix—*Meter, Telephonic*.)

**Chemical Generator of Electricity.**—(See Appendix—*Generator, Chemical, of Electricity*.)

**Chemical Telegraph.**—(See Appendix—*Telegraph, Chemical*.)

**Chemism.**—A word sometimes employed for chemical affinity. (See *Affinity, Chemical*.)

**Chemistry, Thermo** — That branch of chemistry which treats of the measurement of chemical energy in thermal units.

According to Berthelot :

(1.) The amount of heat set free in any chemical reaction is a measure of the total work done during that reaction.

(2.) Changes produced in any system not attended by external effects produce an evolution of heat dependent only on the initial and final states of the system.

(3.) Every chemical change effected in a system independent of external energy tends to produce that body or system of bodies, the formation of which evolves a maximum heat.

**Choke Magnet.**—(See Appendix—*Magnet, Choke*.)

**Chronograph, Spark** — A form of electric chronograph in which the time of a certain event is indicated by means of the spark of a Ruhmkorff or spark coil.

In a form of spark chronograph for measuring the time in which a falling body moves through different parts of its path, the path of the body is marked on a moving sheet of paper by means of a series of sparks from a Ruhmkorff coil.

**Chronometer, Electric** — An electrically controlled or operated mechanism for indicating or recording time. (See *Clock, Electric*.)

**Circuit Closer.**—(See Appendix—*Closer, Circuit.*)

**Circuit Closer for Pull Bell.**—(See Appendix—*Pull Bell, Circuit Closer for.*)

**Circuit, Consumption** — —A circuit in which the energy of the electric current is consumed or utilized for energizing electro-receptive devices.

Electric energy is consumed in all parts of an electric circuit. The term consumption circuit, however, is limited to that part of an electric circuit in which the electro-receptive devices are placed which are energized by the passage of the electric current through them.

**Circuit, Electrical Tuning of** — —(See Appendix—*Tuning of Electrical Circuit.*)

**Circuit, Magnetic, External** — —A term sometimes employed for that part of a magnetic circuit which lies outside of a magnet. (See *Circuit, Magnetic.*)

**Circuit, Magnetic, Internal** — —A term sometimes employed for that part of a magnetic circuit which lies within the magnet. (See *Circuit, Magnetic.*)

**Circuit, Multiple-Parallel** — —A term sometimes employed for a multiple of parallel circuits. (See *Circuit, Multiple.*)

**Circuit, Parallel-Arc** — —A term sometimes employed in place of parallel or multiple circuit. (See *Circuit, Multiple.*)

**Circuit, Resonant** — —A circuit whose dimensions are such as to bring it into resonance with, or to tune it to, the period of another circuit.

**Circuit, Surging** — —An electrical circuit through which electrical surges are passing.

Lodge employs this term, surging circuit, in the following restricted sense.

'I have been accustomed especially to apply the name 'surging circuit' to the case where sparks are obtained not between two distinct parts of a circuit, but between two points on one and the same good conductor,

under circumstances when it does not form the alternative path to anywhere, and when it would ordinarily be supposed that there was no possible reason for a spark at all."

The term surging circuit is applied generally to circuits through which surging discharges are passing; as, for example, the condenser-motor circuit in the Stanley-Kelley system.

**Circuit, Telegraphic, Working Efficiency of** — —The variation or margin between the joint resistance of the conductor and the resistance of the insulator by which the conductor is supported.

According to F. L. Pope the working efficiency may be increased in two ways, viz.,

- (1.) By increasing the insulation resistance.
- (2.) By decreasing the resistance of the conductor.

**Circular Magnetization.**—(See Appendix—*Magnetization, Circular.*)

**Clamp, Feeder** — —Any clamping device for connecting or fastening a feeder wire to a trolley wire.

**Clip.**—A slight break in the signal received in a system of duplex telegraphy under certain circumstances.

**Clip, Feeder** — —In a system of electric street railways a clamp furnished with a device whereby a feeder wire may be readily connected to a trolley wire.

**Clips, Stay-Eye** — —Iron bands clamped to the string beams of the roof with an iron ring projecting from the surface of the roof, to which the stay rods of telegraphic or telephonic standards are screwed.

**Clock, Directing** — —A term sometimes employed instead of controlling or master clock. (See *Clock, Electrical-Controlling.*)

**Clock, Electric, Watchman's** — —A watchman's electric register. (See *Register, Watchman's, Electric.*)

**Clock, Primary Electric** — —A term sometimes employed in place of the controlling or master clock. (See *Clock, Master*.)

**Clock, Standard** — —In a system of time telegraphy the master clock. (See *Clock, Master*.)

**Closed-Circuit Transformer**.—(See Appendix—*Transformer, Closed-Circuit*.)

**Closed-Conducting Sheath for Lightning Protection**.—(See Appendix—*Sheath, Closed-Conducting, for Lightning Protection*.)

**Closer, Circuit** — —Any device for completing or closing a circuit.

**Clown's-Hat Curve**.—(See Appendix—*Curve, Clown's-Hat*.)

**Code, American Morse** — —A term sometimes employed for the Morse telegraphic alphabet. (See *Alphabet, Telegraphic, Morse's*.)

**Code, Dot-and-Dash** — —A term sometimes employed for the Morse telegraphic code. (See *Code, Telegraphic*.)

**Code, International Morse** — —A term sometimes employed for the international telegraphic alphabet. (See *Alphabet, Telegraphic, International Code*.)

**Coil, Faradic** — —A term sometimes employed in place of a Faradic machine or medical induction coil. (See *Machine, Faradic*.)

**Coil, Ground** — —A small rheostat employed in duplex telegraphy at the home station for the purpose of giving the apparatus in such station an equal resistance to the currents coming from the distant station. (Pope.)

The resistance of the ground coil should be equal to the resistance of the spark coil, plus the internal resistance of the battery.

**Coil, Induction Ribbon** — —An induction coil, the primary and secondary cir-

cuits of which are made of metallic ribbons instead of wires.

**Coil, Induction, Self** — —A coil of wire possessing a self induction.

A choking coil. (See *Coil, Choking*.)

**Coil, Spark, Telegraphic** — —A small rheostat employed in duplex telegraphy at the home station in connection with the ground coil. (See Appendix—*Coil, Ground*.)

The resistance of the spark coil should be made sufficiently great to prevent the polarization of the battery when it is momentarily short-circuited.

**Coils, Differential** — —Coils that are differentially wound. (See Appendix—*Winding, Differential*.)

**Coils, Field, of Dynamo** — —The coils of wire wound on the field magnet cores for the production of the magnetic field.

**Coked Core of Incandescent Filament**.—(See Appendix—*Core, Coked, of Incandescent Filament*.)

**Coked Filament**.—(See Appendix—*Filament, Coked*.)

**Coking, Electrical** — —Subjecting a carbon to the coking process. (See Appendix—*Process, Coking, for Filament of Incandescent Electric Lamp*.)

**Coking of Filament**.—(See Appendix—*Filament, Coking of*.)

**Coking Process for Filament of Incandescent Electric Lamp**.—(See Appendix—*Process, Coking, for Filament of Incandescent Electric Lamp*.)

**Collecting Combs**.—(See Appendix—*Combs, Collecting*.)

**Comazant**. —A term formerly applied to St. Elmo's fire.

A corposant. (See *Corposant, Fire, St. Elmo's*.)

**Combination Fittings for Chandelliers, Brackets, etc**.—(See Appendix—*Fittings*,

*Combination, for Chandeliers, Brackets, etc.)*

**Combs, Collecting** — — A term sometimes employed for the collecting points of a frictional electrical machine, or of an electrostatic induction machine. (See *Machine, Frictional Electric, Machine, Electrostatic Induction.*)

**Common Arc of Aurora Glory.**—(See Appendix—*Arc, Common, of Aurora Glory.*)

**Commutator Press-Button.**—(See Appendix—*Button, Commutator-Press.*)

**Commutatorless.**—Not provided with a commutator. (See *Commutator, Dynamo-Electric Machine.*)

**Compass, Declination** — — A declinometer. (See *Declinometer.*)

**Compensated Alternator.**—(See Appendix—*Alternator, Compensated.*)

**Compensating-Alternating Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Compensating-Alternating.*)

**Compensator, Magnetic** — — A device for neutralizing the effects produced on a magnetic needle by the local magnetism of a ship.

**Complex-Harmonic Alternating Electromotive Forces.**—(See Appendix—*Forces, Electromotive, Complex-Harmonic Alternating.*)

**Complex-Harmonic Currents.**—(See Appendix—*Currents, Complex-Harmonic.*)

**Complex-Magnetic Shell.**—(See Appendix—*Shell, Complex-Magnetic.*)

**Compound Alternator.**—(See Appendix—*Alternator, Compound.*)

**Compound Battery.**—(See Appendix—*Battery, Compound.*)

**Compound Electro-Magnet.**— A term sometimes applied to an induction coil. (See Appendix—*Magnet, Electro-Compound.*)

**Compound Magnet.**— (See Appendix—*Magnet, Compound.*)

**Concentration Throw.**—(See Appendix—*Throw, Concentration.*)

**Concentric Cable.**—(See Appendix—*Cable, Concentric.*)

**Concentric Wiring.**—(See Appendix—*Wiring, Concentric.*)

**Conductance, Specific** — — Specific conductivity. (See *Conductivity, Specific*.)

**Conductibility.**—Possessing the power of conducting electricity.

**Conductivity.**

**Conducting Cord and Tip.**—(See Appendix—*Cord and Tip, Conducting.*)

**Conducting Cord Tip.**—(See Appendix—*Tip, Conducting Cord.*)

**Conduction Lightning Protection.**—(See Appendix—*Protection, Conduction Lightning.*)

**Conduction Lightning Protector.**—(See Appendix—*Protector, Conduction Lightning.*)

**Conduction, Metallic** — — A term sometimes employed for the conduction of electricity through a solid conductor in contradistinction to its conduction through an electrolyte. (See *Conduction, Electrolytic.*)

**Conduction Resistance.**—(See Appendix—*Resistance, Conduction.*)

**Conductivity, Percentage, of Wire** — — The conductivity of a particular copper wire compared with the conductivity of another wire of the same dimensions of pure material at a standard temperature.

The percentage conductivity is readily obtained by multiplying the calculated resistance of the pure material by 100 and dividing the result by the measured resistance of the particular wire.

**Conductor, Electric, Glowing of** — — Emitting light from any conductor heated to electrical incandescence.



The current strength required to produce a glow in a conductor varies in a marked manner with the character and density of the gas surrounding the conductor.

**Conductor, Electric, Melting of** — — Fusion of a conductor by means of the heat of electric currents.

The strength of current required to fuse or melt a conductor varies with a number of circumstances, so that a wire which will not fuse under the influence of a certain current strength may fuse at another time under a much smaller current strength if the conditions are different. Among these influences may be mentioned the nature of the medium surrounding the conductor, as well as the temperature of said medium. Sometimes, too, a coating of oxide forms on the surface of the conductor, which modifies its ability to throw off or radiate its heat.

When subjected to alternating currents a fuse wire has its fusing point gradually lowered.

**Conductor, Electric, Volatilization of** — — The volatilization of a conductor produced by the passage of an electric current through it.

The current required to volatilize a conductor will necessarily vary with the same circumstances that modify its electric glowing or melting (See Appendix—*Conductor, Electric, Glowing of. Conductor, Electric, Melting of.*)

**Conductor or Line Wire, Dip of** — — The sag of a telegraphic or telephonic wire or conductor between two supports due to its weight.

**Conductor Resistance.**—(See Appendix—*Resistance, Conductor.*)

**Conductor, Semi** — — A term sometimes applied to substances, such as acids, saline salts, water, etc., whose power of conduction for electricity is neither very high nor very low.

Substances that occupy an intermediate position between conductors and so-called non-conductors for electricity.

**Conductor, Stranding of** — — Forming a conductor of several smaller conductors for the purpose of reducing the self-induction or eddy currents, or of increasing its flexibility. (See *Induction, Self.*)

**Conductor System for Railroad.**—(See Appendix—*Railroad, Conductor System for.*)

**Conflict, Electric** — — A term proposed by Oersted for a magnetic field surrounding a conductor through which a current of electricity is flowing.

Oersted speaks as follows of his discovery of the magnetic qualities of the region around a conductor through which an electrical current is flowing: "That this conflict performs circles around the wire, for without this condition it seems impossible that one part of the wire when placed below the magnetic needle shall drive its pole to the east, and when placed above it to the west."

**Connector, Copper** — — A particular form of connector employed in the gravity voltaic cell for connecting the copper element to the circuit wire or conductor.

A name applied technically to a form of electric light fitting or coupler for connecting large wires or conductors.

**Consonance.**—Literally, sounding at the same time.

Strictly speaking, two sounds are said to be in consonance when they are sounded together. In this sense we speak of pleasing consonances or harmonious chords. Often, however, the word consonance is used in contradistinction to dissonance as indicating two sounds that are in unison with each other.

The word consonance is also frequently employed in the sense of increasing or reinforcing a sound, such, for example, as the method of increasing the sound produced by a vibrating string or cord by stretching the cord over an elastic body like a table. In such cases the table takes up the motions or vibrations of the cord, and, by thus setting in motion a greater mass of air, increases the



amplitude of the waves and consequently the intensity of the sound. This use of the word consonance is to be distinguished from resonance, in which an increase in the intensity of the sound is also produced by waves or vibrations set up in another body with, however, this difference: in the case of resonance the re-enforcement is effected by vibrations set up in a body that is tuned to vibrate in exact unison with a vibrating body; while in the case of consonance no such tuning is necessary; or, briefly, consonant vibration is forced vibration, while resonant vibration is natural or free vibration excited by the vibrating body.

**Consonator.**—Any body possessing the power of increasing the strength of sound by consonance. (See Appendix—*Consonance*.)

This use of the word consonator is analogous to the use of the word resonator; viz., a body having the power of increasing the strength of sound by resonance. (See *Resonator*.) A consonator, however, differs from a resonator in the manner in which it strengthens the sound.

**Constant-Potential Motor.**—(See Appendix—*Motor, Constant-Potential*.)

**Constant, Verdet's** — — The magneto-optic constant of a transparent substance, usually expressed in minutes of arc rotation of the plane of polarization, for a luminous ray of definite wave length through the magnetized substance at a definite temperature between points on the ray path whose magnetic potential differs by unity.

Verdet's constant is usually taken for the D line at the temperature of 15°C. Its value for monohydrated sulphuric acid according to Bichat, and Mascart and Joubert equals 0.0204'.

**Consumption Circuit.**—(See Appendix—*Circuit, Consumption*.)

**Contact Breaker.**—(See Appendix—*Breaker, Contact*.)

**Contact, Drop Relay** — — A form of

relay contact in which the attraction of an armature on the passage of a current releases a drop and thus completes a local circuit which remains closed until the drop is replaced or reset.

By the suitable combination of a drop relay and a bell, the bell may become a continuous ringing bell.

**Contact, Floor** — — A term sometimes employed in place of floor push. (See *Push, Floor*.)

**Contact, Full** — — A variety of fault produced by a part of the circuit being accidentally placed in contact with a good metallic circuit. (See *Contacts*.)

**Contact, Relay** — — A term frequently applied to a form of electro-magnetic instrument by means of which a local circuit is completed by the passage of a current.

A relay contact is in reality a form of key or push, which, instead of being opened or closed by means of the hand, is closed by means of an electro-magnet. Relay contacts are of two kinds, namely, spring relay contacts and drop relay contacts.

**Contact Resistance.**—(See Appendix—*Resistance, Contact*.)

**Contact, Spring Relay** — — A form of relay contact which is interrupted by the action of a spring, as soon as the current is broken.

**Contact Theory of Electricity.**—(See Appendix—*Theory, Contact, of Electricity*.)

**Contact, Total** — — A term sometimes employed for full metallic contact. (See *Contact, Full-Metallic*.)

**Contact, Window or Blind** — — A variety of burglar-alarm contact by means of which an alarm bell is rung by a slight pressure against a blind caused by any attempt to enter from without after having broken the glass in the window. (See *Alarm, Burglar*.)

**Contacts, Burglar Alarm** — — Contacts by means of which the opening or closing of a door or window, or the passage of a person across a given space, is caused to ring an alarm bell. (See *Alarm, Burglar*.)

**Continuous Action of Electric Bell**.—(See Appendix—*Bell, Electric, Continuous Action of*.)

**Continuous Current Arc**.—(See Appendix—*Arc, Continuous Current*.)

**Continuous Current Transformer**.—(See Appendix—*Transformer, Continuous Current*.)

**Contracting Magnetic Whirl**.—(See Appendix—*Whirl, Contracting Magnetic*.)

**Contraction, Over-Maximal** — — An increase in the electrical stimulation of a motor nerve beyond the point where an apparent maximum stimulus has been reached.

Between the condition of the first maximum and the second maximum an increase in the strength of the current is followed by a decrease in the stimulation. On, however, a further increase in the current strength a second increase in the contraction, termed the over-maximal contraction, occurs.

**Contraplex Telegraph**.—(See Appendix—*Telegraph, Contraplex*.)

**Convection Transference**.—(See Appendix—*Transference, Convection*.)

**Conversion of Electromotive Force**.—(See Appendix—*Force, Electromotive, Conversion of*.)

**Conversion, Ratio of** — — A term sometimes employed instead of ratio of transformation. (See Appendix—*Transformation, Ratio of*.)

**Convert**.—To transform or change.

**Converter, Rotary** — — A rotary transformer. (See Appendix—*Transformer, Rotary*.)

**Converting**.—Transforming or changing.

**Co-phasal**.—Two or more quantities which vary harmonically, and whose rates of increase or decrease at any given time maintain a constant ratio.

**Co-phasal Alternations**.—(See Appendix—*Alternations, Co-phasal*.)

**Copper Arc**.—(See Appendix—*Arc, Copper*.)

**Copper Connector**.—(See Appendix—*Connector, Copper*.)

**Copper-Lead Accumulator**.—(See Appendix—*Accumulator, Copper-Lead*.)

**Copper Resistance**.—(See Appendix—*Resistance, Copper*.)

**Copper Shell of Electrotpe**.—(See Appendix—*Shell, Copper, of Electrotpe*.)

**Copper-Zinc Accumulator**.—(See Appendix—*Accumulator, Copper-Zinc*.)

**Cord and Tip, Conducting** — — A conducting cord provided at one of its ends with a tip for the purpose of ready insertion in a wall socket.

**Cord, Incandescent Lamp** — — A flexible lamp cord of two strands suitable for use with a pendent incandescent lamp.

**Core, Coked, of Incandescent Filament** — — A filament for an incandescent electric lamp, formed of a core of electrically coked carbon, whose surface is covered with a deposit of carbon derived from the electrical decomposition of a hydrocarbon gas or vapor.

**Core Loss of Transformer**.—(See Appendix—*Loss, Core, of Transformer*.)

**Core Pins of Magnet**.—(See Appendix—*Pins, Core, of Magnet*.)

**Cores, Krizik's** — — Cores for magnetic solenoids shaped so as to insure an approximately uniform pull in different positions in the solenoid. (See *Bars, Krizik's*.)

**Coreless Armature of Dynamo or Motor**.—(See Appendix—*Armature, Coreless, of Dynamo or Motor*.)

**Corona, Electrostatic** — — A luminous effect produced on the surface of a thin sheet of mica, or other similar insulating material, when placed between two electrodes between which discharges of comparatively high difference of potential are passing.

Steinmetz describes the phenomena of the electrostatic aurora and corona in the *Electrical Engineer* for April 5, 1893, as follows:

"Very interesting luminous effects take place when a thin sheet of good insulating material, as mica, is placed between the electrodes. At a difference of potential of 830 volts and a thickness of mica of 1.8 millimetres, in darkness a faint bluish glow becomes visible between the mica and the electrodes. This glow is very perceptible at 970 volts, and faintly visible in broad daylight at 1,560 volts. With increasing difference of potential, this bluish glow increases in intensity, forming a sharply defined, smooth blue line around the electrodes at their point of contact with the mica.

"At a difference of potential of 4.5 kilovolts—thickness of mica of 2.3 millimetres—violet creepers of about two mm. length break here and there out of the line of bluish glow. These creepers are distinctly different from the blue glow surrounding the electrodes and increase in number and length with increasing potential, until they form a broad electrostatic aurora surrounding the electrodes on either surface of the mica sheet, consisting of an infinite number of small violet streamers, rushing with a hissing noise over the mica. This corona increases rapidly in width until it reaches the edges of the mica sheet. Then white sparks of intense brightness pass from electrode to electrode over the surface of the mica, first few in number, then with increasing potential, covering the whole sheet with an infinite number of streaks of lightning with a roaring noise. The amount of current passing through these sparks is exceedingly small, for no perceptible reaction upon the primary circuit was noticed. The length of these sparks is many times larger than the

spark distance in air, being tenfold at 17 kilovolts. They are intensely hot, and leave whitish marks, due to calcination, on the mica when passing over it. The sheet of mica, and especially the electrodes, become heated very rapidly, the mica twists and begins to splinter, to separate into sheets, until finally it breaks down.

"The width of the electrostatic corona is half the length of these sparks. The length of these sparks depends somewhat upon frequency and the thickness of the mica sheet, being greater for higher frequency and thinner mica disc, but apparently only in so far as the capacity, or rather the charging current of the condenser, represented by the mica disc as dielectric, is increased thereby."

**Corrosion, Electrolytic** — — A term frequently employed for the corrosion of water or gas pipes or other masses of metal buried in the earth by electrolytic action.

In the case of such large currents as those employed in the electric railway car systems, or other similar earth-connected circuits, the corrosion may become marked. In such cases electrolytic corrosion is due to the return current.

The amount of corrosion varies according to whether the railroad tracks are made the positive or negative terminal of the driving motor.

It is claimed by some that electrolytic corrosion is lessened by connecting the trolley line to the negative terminal of the battery and the tracks to the positive terminal.

Perrine describes this matter as follows:

"A more complete system of grounding seems, however, to offer at least a partial solution of this difficulty, which may only be completely worked out in a careful study of the special conditions in some particular case.

"For such a complete system of grounding, in order to reduce to a minimum electrolytic corrosion, the negative pole of the dynamo should be connected to the trolley and feeder line; then at the station connections should be made not only with the rails

wells, but also with all water and gas, which piping system should also be directly connected to the track and track bed, so that whatever current passes by medium of these pipes should flow out of earth into them, and thence to the rails means of metallic and not electrolytic action. If this be completely accomplished there can be no corrosion of the pipes caused by the current flowing out of the pipes to the rails, and the only corrosion possible will be that due to the local action caused by the difference of potential along the pipes themselves."

It would appear that the total corrosion of pipes that are not in metallic connection with the track is independent of the polarity of the terminal, since the same amount of current which enters the pipe from the ground must leave it by again passing to ground. In this manner the area of entrance into the pipe is protected and its area of exit corroded electrolytically. By changing the polarity the protected and corroded parts are merely interchanged.

By making the shunt current passing through the pipes leave the pipes by means of a metallic conductor instead of by the ground, the entire system of pipes is brought to the potential of the ground and a complete or partial protection is thus effected. Experiments made on the West End Railroad of Boston and elsewhere, appear to show that it makes but little difference which terminal is connected to earth. It is by now considered best to alternately connect positive and negative terminals to earth every period of a week at a time and not to connect on the earth for a return, or make use of a supplemental wire, but to double the rails with heavy copper wire, place the connections back  $2\frac{1}{2}$  to 3 feet respectively from the end of the rails to avoid the effect of the joint. With a rail 70 pounds per yard, on a four track road, this is equivalent to about 28 inches cross-section of the carrying capacity of which is  $4\frac{1}{2}$  inches of copper. If, therefore, an equally good connection is made from the rails to a generator at the power station, there is provided a path capable of carrying

10,000 amperes without undue heating. Rails bonded in this manner and used as returns, will avoid the variable resistance of the earth arising from dry weather, poor contact with earth, frost, etc., and will consequently avoid electrolytic corrosion in neighboring pipes.

**Cosine Law of Illumination.**—(See Appendix—*Illumination, Cosine Law of.*)

**Coulomb, International** — — The value of the international coulomb adopted by the Chicago Congress of 1893, as equal to the quantity of electricity transferred by a current of one international ampere in one second.

**Coulomb Meter.**—(See Appendix—*Meter, Coulomb.*)

**Coulomb's Electric Balance.**—(See Appendix—*Balance, Coulomb's Electric.*)

**Coulomb's Magnetic Torsion Balance.**—(See Appendix—*Balance, Coulomb's Magnetic Torsion.*)

**Counter, Electro-Chronometric** — — An apparatus employed in a system of electrical clocks to so transmit the motion of an ordinary clock to a number of separate clocks as to control or operate them.

Electro-chronometric counters consist essentially of two parts, namely,

(1.) The indicator or apparatus connected with the regulating clock and operating to periodically make and break the current of a battery.

(2.) The mechanism that moves the clock hands when actuated by the current sent into the line by the indicator.

**Counter-Electromotive Force of Electrolysis.**—(See Appendix—*Electrolysis, Counter-Electromotive Force of.*)

**Couple, Molecular Voltaic** — — A voltaic couple formed of the atoms or radicals of a molecule.

Lermantoff has shown that during the development of the photographic image in moist collodion a true electrolysis occurs, each silver molecule produced by the action of the light on the sensitized plate forming a



voltic couple with a molecule of silver nitrate and a molecule of iron sulphate of a developer.

**Crater of Arc.**—A crater formed in the end of the positive carbon electrode in a carbon voltaic arc. (See *Arc, Voltaic*.)

**Creeping of Bolt.**—(See Appendix—*Bolt, Creeping of*.)

**Cross-Fire.**—A term employed in telegraphy for an escape or leakage of current from one telegraphic line to another, due to defective insulation.

A cross-fire is sometimes called a weather cross. (See *Cross, Weather*.)

**Cross-Induction of Dynamo Armature.**—(See Appendix—*Induction, Cross, of Dynamo Armature*.)

**Cross, Metallic** — —A form of fault attended by a leakage or escape of current from a telegraphic line due to the absolute contact between two or more wires or conductors, so that part of the current from one line passes to the other.

**Cross-Over, Trolley** — —In a system of electric street railways a device permitting the ready passage of a trolley wheel in a continuous direction from one to another of two adjacent wires.

**Cross, Peltier's** — —A cross made by placing two plates of dissimilar metals in contact at right angles to each other, and employed for the study of the Peltier effect. (See *Effect, Peltier*.)

**Crossing Frog.**—A term sometimes employed in place of trolley cross-over.

**Crystal, Pyro-Electric** — —Any crystalline substance capable of producing pyro-electric phenomena on being unequally heated.

Tourmaline, electric calamine, boracite, quartz, tartrate of potash, and sulphate of quinine are examples of pyro-electric crystals.

**Cubic Energy.**—(See Appendix—*Energy, Cubic*.)

**Cup Brush.**—(See Appendix—*Brush, Cup*.)

**Current Accumulator.**—(See Appendix—*Accumulator, Current*.)

**Current, Arriving, of Telegraphic Circuit** — —A term employed to designate the current on a telegraphic line or conductor near the distant end of the wire close to where it enters the ground or earth.

**Current, Axial** — —A term proposed for a current whose direction coincides with the direction of the lines of magnetic force.

This use of the term axial current is in contradistinction to a radial current, or one whose direction is at right angles to the direction of the lines of magnetic force.

The term axial current is employed in electro-therapeutics in a different sense to the above. (See *Current, Axial*.)

**Current, Beginning of** — —A term sometimes employed for the making or closing of the current in any circuit.

**Current, Bony** — —A term proposed by Becquerel for the electric current resulting from the difference of potential existing between two different parts of a bone of a recently killed animal.

If a bone be taken from a recently killed animal and the marrow connected by means of metallic terminals with the surface of the bone, an electric current will flow through the circuit, for which Becquerel proposed the name bony current.

This term is not generally adopted.

**Current, Cessation of** — —A term sometimes employed for the breaking of the current in any circuit.

**Current, Demagnetizing** — —A current whose magnetic field is employed to decrease the strength of an already existing magnetic field by directing its lines of force oppositely to that of the existing field.



**rent, Effective** — — A term proposed by Ayrton, but not accepted, for the current producing a given effect.

This term, Ayrton thinks, is an unfortunate one, since the effective current will of course depend on the character of the effect the current is desired to produce.

However, the word "effect" be understood to mean "power," then the vagueness of the term, and, since the power is proportional to the square of the current, the effective current is the square root of the mean square current, but all the effects produced by an alternating current are proportional to the square root of the mean squares.

The ordinary meaning of effective current is given it by the definition of the Electric Congress of Paris, in 1889, viz., the current the root of the time average of the square of the current.

An alternating or periodically varying current has an "effective" strength such that if this effective strength were steadily maintained in the same direction through a resistance it would generate as much heat in a given length of time as the periodical current.

In electrolysis or the magnetization of iron, the effect produced, the effective current is identical with the mean current. In heating or dynamometric effect is to be produced, the effective current is equal to the square root of the mean square of the current.

**rent, Effective Starting, of Motor**

— The indicated value of the starting current of a motor as observed on an ammeter.

**rent Efficiency of Secondary Battery.**

Appendix—*Battery, Secondary, and Efficiency of.*

**rent, Entering, of Telegraphic (Current)**

— A term employed to designate the current on a telegraphic line or conductor near the battery.

**rent, Harmonics of** — — A term sometimes used for the upper harmonics of

a current. (See Appendix—*Current, Upper Harmonics of.*)

**Current, M.** — — A term proposed by Ayrton for mean current.

This term, M. current, is employed to signify the average value with respect to time, and is obtained by dividing the total quantity of electricity which passes through a given circuit in a given number of seconds by the number of seconds. It has not been generally accepted.

**Current, M. S.** — — A term proposed by Ayrton for mean square current.

This term was proposed in order to avoid the use of the alleged vague term, effective current. It applies to cases where the effective current has a value equal to the mean square of the current. It has not been generally accepted.

**Current, Maximum Starting, of Motor** — — The highest value that the starting current of a motor attains.

**Current of Charge on Telegraphic Line.** — (See Appendix—*Line, Telegraphic, Charge Current on.*)

**Current, Polyphase** — — A term now generally employed in place of multiphase current. (See *Current, Multiphase.*)

**Current, Polyphase Alternating, Proposed A. I. E. E. Definition for** — — A combination of more than two alternating currents differing in phase.

**Current, R. M. S.** — — A term proposed by Ayrton for the square root of the mean square of the current.

This term was proposed in order to avoid the use of the alleged vague term, effective current. It applies to cases where the effective current has a value equal to the square root of the mean square of the current. It has not been generally accepted.

**Current, Radial** — — A term proposed for a current whose direction is at right angles to the direction of the lines of magnetic force.

This use of the word radial current is in contradistinction to the word axial current, whose direction coincides with that of the lines of magnetic force. (See Appendix—*Current, Axial.*)

**Current, Simple or Two-Phase Alternating** — — Two alternating currents whose phases differ by  $90^\circ$  or by  $270^\circ$ .

**Current, Sinusoidal** — — A term sometimes employed for sinuous current. (See *Current, Sinuous.*)

A simple-harmonic current in respect to time.

A current whose strengths graphically set forth as ordinates as time to abscissas follow a sinusoidal curve.

**Current, Starting, of Motor** — — The current which a motor requires in order to start from a state of rest.

**Current Transformation.**—(See Appendix—*Transformation, Current.*)

**Current, Triphase** — — A term sometimes employed in place of three-phase current. (See Appendix—*Currents, Three-Phase.*)

**Current, Triphase Alternating, Proposed A. I. E. E. Definition for** — — Three alternating currents whose phases differ by  $60^\circ$  or  $120^\circ$ .

**Current, Tubular** — — A term sometimes applied to a current that traverses the superficial portions only of a conductor.

When a rapidly intermittent current is sent through a solid conductor, the current density is greater at the surface of the conductor than in the central portions, and, when the rapidity of alternation becomes very great, is confined to an exceedingly thin outer layer.

A tubular current possesses no magnetizing power on anything placed inside the tube.

**Current, Upper Harmonics of** — — A series of higher harmonic currents of greater frequency than the fundamental current impressed on a simple-harmonic

current by any means. (See Appendix—*Currents, Complex-Harmonic.*)

**Current, Virtual** — — A somewhat vague term sometimes employed for a current virtually equivalent to something else.

A term employed for the square root of the mean square of the current strength.

**Current, Working, of Motor** — — The current required to maintain a motor when its load is on.

**Currents, Complex-Harmonic** — — Currents which result from the superposition of several simple-harmonic currents. (See *Current, Simple-Harmonic.*)

Currents resulting from the co-existence of the higher harmonic currents with the fundamental harmonic current.

Unless certain precautions are taken the currents produced in the secondary circuit of a transformer or induction coil are by no means simple-harmonic currents. It is true, of course, that the fundamental frequency has the same frequency as that of the currents sent through the primary circuit, but the currents so induced in the secondary, however, are complex-harmonic currents, their frequency depending, according to Pupin: "On the fundamental frequency of the ohmic resistance, and especially on the self-induction and electrostatic capacity of the primary or secondary circuits."

Complex-harmonic currents of the secondary of induction coils possess a fundamental frequency the same as the frequency of the currents impressed on the primary, but they have associated with them a number of higher harmonic currents, which correspond to the overtones of a musical note.

These overtones are due to rapid electrical oscillations accompanying the spark discharges. The association of these higher harmonic currents with the fundamental harmonic current produces what are called complex-harmonic currents.

Complex-harmonic currents always exist when there is iron in a circuit, especially if the iron is highly magnetized, when they are due to the fact that the magnetization pro-

duced is not proportional to the magnetizing force.

It is only in circuits of constant resistance, containing no iron, that the current produced by a simple harmonic or sine wave of E. M. F. is a sine wave. Magnetic hysteresis, or a periodically varying resistance as by an electric arc, causes a distortion of the current and a consequent superposition of higher harmonics on the fundamental wave. Consequently the primary currents of transformers at open secondary circuit or very light load are complex harmonics, and approach more nearly to true sine shapes at increasing loads. When, however, the secondary E. M. Fs. of a transformer are simply harmonics, the secondary currents are also simply harmonics, in circuits without iron cored coils.

Currents produced by complex-harmonic E. M. F. are also complex harmonic; generally, however, the higher complex harmonics of the E. M. F. wave are larger than the complex harmonics of the current wave.

**Currents, Mutually-Induced** — —Currents set up or produced by means of mutual induction. (See *Induction, Mutual*.)

**Currents, Polyphase** — —Currents differing in phase from one another and, therefore, requiring separate circuits for use.

The currents may differ from one another by one-half phase, by one-third of a phase, a quarter phase and so on, when they are respectively called di phase or two phase currents, triphase or three-phase currents, and four-phase currents. An ordinary alternating current is called a single phase or uniphase current. The latter term is the preferable one.

The term polyphase currents is applied to all currents over three-phase, though sometimes also to all currents over two-phase.

**Currents, Polyphased, Alternating** — —Two or more alternating currents differing in phases from each other.

**Currents, Skin** — —A term some-

times applied to the currents that are limited to the surface of a solid conductor.

Rapidly alternating currents are limited to the surface of solid conductors since before any such currents have time to penetrate toward the centre of a solid conductor their direction is reversed, thus limiting them to the surface portions.

**Currents, Three Phase** — —Triphased currents. (See Appendix—*Currents, Triphased, Alternating*.)

**Currents, Triphased, Alternating** — —Three alternating currents differing 120° in phase from each other.

In the two-phase system two currents differing in phase 90° have a common return wire whose area should be  $\sqrt{2}$  greater than either leading wire.

In the three-phase system each of three currents differing in phase 120° uses alternately one or two of the three wires for a return.

**Curve, Arrival of Telegraph Circuit** — —A curve of ordinates and abscissas which represent respectively the times and the gradual increase of current at the receiving end of a telegraph circuit from the time the circuit is closed until the time the current has reached its full strength.

**Curve, Clown's Hat** — —A term proposed for the curve of a current or electromotive force in which the pressure generated increases or decreases at a maximum rate of change.

The name is taken from the shape of the curve being somewhat similar to the shape of a peaked or clown's hat.

**Curve, Top Hat** — —A term proposed for the current or E. M. F. in which the pressure generated is fairly constant for a considerable time at its maximum rise and fall.

The name is taken from the shape of the curve being somewhat similar to that of a top-hat, or flat crowned hat. A current for the primary of a transformer or induction

coil, however, of the top-hat type, makes a bad form of secondary current curve, for in such a curve the rate of change, whether increasing or decreasing, would be small. The current whose curve of electromotive force is sharp and peaked like a clown's hat would, of course, be preferable.

**Cut-In, A** — A term sometimes employed in place of film cut-out.

An automatic-guard cut-out. (See *Cut-Out, Film*.) (See Appendix—*Guard, Automatic, for Series-Connected Incandescent Lamps*.)

**Cut-Out, D. P.** — A contraction for double-pole cut-out. (See Appendix—*Cut-Out, Double-Pole*.)

**Cut-Out, Double-Pole** — A cut-out which provides in one operation the cutting out of both the positive and the negative leads.

**Cut-Out, Electro-Magnetic** — A term sometimes employed for a cut-out operated by means of an electro-magnet. (See *Cut-Out, Automatic, for Series-Connected Electro-Receptive Devices*.)

A form of electro-magnetic cut-out is used

in charging accumulators and sometimes in street railway circuits.

**Cut-Out, S. P.** — A contraction for single-pole cut-out. (See Appendix—*Cut-Out, Single-Pole*.)

**Cut-Out, Single-Pole** — A cut-out by means of which the circuit is broken or cut in one of the two leads only.

**Cut-Out, Wedge** — A form of cut-out employed on telegraphic circuits.

The ends of the instrument wire are connected to the opposite sides of a wedge formed of two brass plates suitably insulated from one another. The ends of the line wire or conductor are suitably connected to two metallic pieces that are maintained in electrical contact by means of a spring electrically connected to one of the pieces and caused to bear with elastic pressure against the other piece. In order to introduce an instrument into the line circuit, a switch-wedge, or plug, is inserted between the two pieces, and, thus separating them, opens the circuit of the line wire or conductor, and at the same time connects it with the instrument thus introduced.

**Cyclic**.—Of or pertaining to a cycle. (See *Cycle*.)

## D

**D. B. Switch**.—(See Appendix—*Switch, D. B.*)

**D. P. Cut-Out**.—(See Appendix—*Cut-Out, D. P.*)

**D. P. Switch**.—(See Appendix—*Switch, D. P.*)

**Damping Magnet**.—(See *Magnet, Damping*.)

**Dark Discharge**.—(See Appendix—*Discharge, Dark*.)

**Dark Segment of Aurora**.—(See Appendix—*Segment, Dark, of Aurora*.)

**Dead Ground**.—(See Appendix—*Ground, Dead*.)

**Declination Compass**.—(See Appendix—*Compass, Declination*.)

**Decomposition, Electro-Chemical** — A term often employed for electrolytic decomposition. (See *Electrolysis*.)

**Decomposition, Molecular** — The separation or breaking up of a molecule into its constituent atoms or radicals.

Molecular decomposition may be effected in the following ways, namely:

- (1) By electrolysis, or the action of an electric current.
- (2) By thermolysis, or the action of heat.
- (3) By actinism, or the action of light.



(4) By chemism, or the action of superior chemical affinity.

(5) By pressure.

**Deflecting Magnet.**—(See Appendix—*Magnet, Deflecting*.)

**Degree, Water-Gramme** — —The amount of heat required to raise the temperature of one gramme of water at 4° C., the temperature of its maximum density, one degree centigrade.

A small calorie. (See *Calorie, Small*.)

**Delta Triphase System.**—(See Appendix—*System, Delta Triphase*.)

**Demagnetizing Current.**—(See Appendix—*Current, Demagnetizing*.)

**Depolarizer.**—The material employed in a voltaic cell for the purpose of depolarizing it. (See *Cell, Voltaic, Polarization of*.)

In most cases the depolarizer is a different liquid and is kept separate from the exciting liquid or electrolyte. In some cases, however, the depolarizer is mixed with the exciting liquid.

**Deposit, Electro-Metallurgical Burnt** — — A term sometimes applied to a black deposit of metal which is thrown down when the intensity of the depositing current is too strong. (See *Deposit, Electro-Metallurgical*.)

**Deviation, Quadrantal, of Mariner's Compass** — —The deviation of the magnetic needle due to the induced magnetism in the iron of a ship acting as a mass of soft iron, and not as a permanent magnet.

Quadrantal deviation changes sign and passes through successive opposite maxima four times in one complete revolution of the ship.

Quadrantal deviation is corrected by placing masses of soft iron, usually spherical in shape, in suitable positions on each side of the compass.

**Deviation, Semi-Circular, of Mariner's Compass** — —The deviation of a magnetic needle due to the permanent mag-

netism in the iron of a ship having its resultant in the horizontal plane.

Semi-circular deviation passes through two opposite maxima and two zero points as the ship completes a revolution, and these zero points of deviation occur when the resultant magnetic axis of the ship coincides with the magnetic meridian.

Semi-circular deviation is corrected by fastening a permanent magnet in the proper position near the compass to neutralize the influence of the ship's iron.

**Diagram, Load** — — A diagram or curve representing to scale the load or activity of a plant at different times.

**Dial, Induced Single-Needle** — — A dial employed in single-needle telegraphy in which both the needle and its axle are formed of soft iron and have magnetism induced in them by means of permanent horseshoe magnets placed so as to act magnetically on the needle.

The object of the induced single-needle telegraphic dial is for the purpose of avoiding the weakening of the magnetism of the needle, or its total loss or reversal, by various means, such, for example, as a discharge of lightning, the effect of earth currents, etc.

**Dial Telegraph.**—(See Appendix—*Telegraph, Dial*.)

**Dialyzing.**—Subjecting to the process of dialysis. (See *Dialysis*.)

**Diamagnetized.**—Endowed with diamagnetic properties. (See *Diamagnetism*.)

**Diamond Drill.**—(See Appendix—*Drill, Electric, Diamond*.)

**Dielectric, After-Working of** — — A term sometimes employed for a residual charge. (See *Charge, Residual*.)

The term after-working of a dielectric was proposed by Boltzmann. It is not much used in the United States.

**Dielectric, Breaking-Down of** — — Such a weakening of a dielectric that permits a disruptive discharge to pass through



its substance. (See Appendix—*Dielectric, Disruptive Strength of.*)

**Dielectric, Disruptive Strength of** —  
—The resistance which an insulating medium or dielectric offers to the disruptive passage of an electric discharge through it.

According to Steinmetz the disruptive strength of different materials shows no relation to their electric resistance.

**Dielectric Hysteresis.**—(See Appendix—*Hysteresis, Dielectric.*)

**Difference of Tension.**—(See Appendix—*Tension, Difference of.*)

**Differential Coils.**—(See Appendix—*Coils, Differential.*)

**Differential Electro-Dynamometer.**—(See Appendix—*Dynamometer, Electro, Differential.*)

**Differential Electro-Magnet.**—(See Appendix—*Magnet, Differential, Electro.*)

**Differential Winding.**—(See Appendix—*Winding, Differential.*)

**Diffusing Globes for Electric Lights.**—  
(See Appendix—*Globes, Diffusing, for Electric Lights.*)

**Di-Phase Armature.**—(See Appendix—*Armature, Di-Phase.*)

**Di-Phase Generator.**—(See Appendix—*Generator, Di-Phase.*)

**Di-Phase Motor.**—(See Appendix—*Motor, Di-Phase.*)

**Diplex Telegraph.**—(See Appendix—*Telegraph, Diplex.*)

**Dip of Line Wire or Conductor.**—(See Appendix—*Conductor or Line Wire, Dip of.*)

**Dipping Basket.**—(See Appendix—*Basket, Dipping.*)

**Dipping Hook.**—(See Appendix—*Hook, Dipping.*)

**Dips.**—Acid solutions employed in electro-plating in which articles that are to be plated are cleansed by dipping.

**Direct-Current Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Direct-Current.*)

**Direct-Current Exciter.**—(See Appendix—*Exciter, Direct-Current.*)

**Direct-Current Rotary Transformer.**—  
(See Appendix—*Transformer, Direct-Current Rotary.*)

**Direct Reading Galvanometer.**—(See Appendix—*Galvanometer, Direct Reading.*)

**Direct Working of Telegraphic Sounder.**—  
(See Appendix—*Working, Direct, of Telegraphic Sounder.*)

**Directed-Streaming Discharge.**—(See Appendix—*Discharge, Directed-Streaming.*)

**Directing Clock.**—(See Appendix—*Clock, Directing.*)

**Disc, Retarding** — —A copper disc supported on a rotating shaft, and so placed as to cut the lines of force from a magnet for the purpose of retarding the speed of rotation.

In Elihu Thomson's recording electric meter a copper disc, moving in the field of a permanent magnet, is so retarded that the resulting number of revolutions is directly proportional to the energy to be measured.

**Discharge, Dark** — —A term applied by Faraday to that portion of a convective discharge, separating the positive from the negative electrode, that occurs under certain circumstances through a rarefied gas.

**Discharge, Directed-Streaming** — —  
A Tesla discharge which assumes the shape of a hollow luminous cone.

The discharge takes place between a sphere or ball S (Fig. 570), and a ring-shaped electrode.

thereby producing a hollow luminous cone such as is shown in the figure.

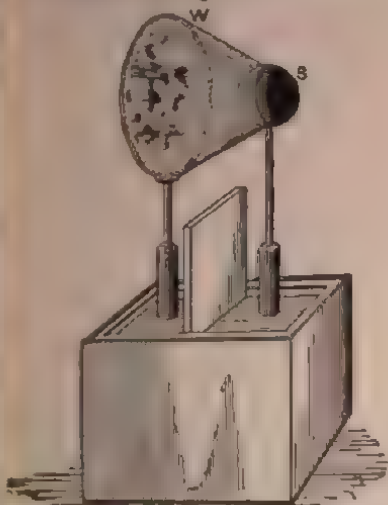


Fig. 570. Directed-Streaming Discharge.

**Discharge, Luminous Disc-Shaped** — A name given to a variety of Tesla discharge that occurs between ring-shaped terminals.

The terminals are arranged as shown in Fig. 571. On the passage of the current a luminous

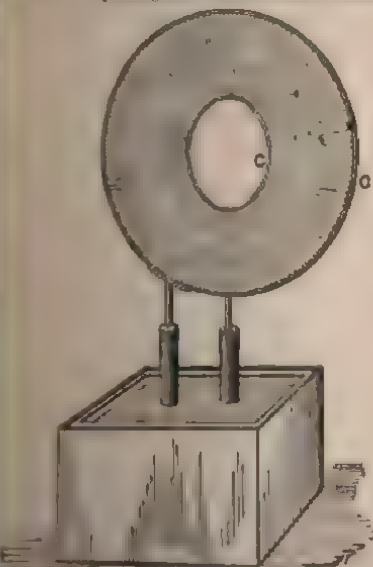


Fig. 571. Luminous Disc-Shaped Discharge.

Disc-shaped discharge occurs between the ring-

shaped terminals C, C, which presents the appearance shown in the figure.

**Discharge, Slow, Method of** — An insulation test for a well-insulated telegraphic line, by the observation of the rate at which a charge leaks out when the conductor is left insulated.

A well-insulated cable will take, say, half an hour to fall to half charge, and, with uniform cables, this time is independent of their length.

**Discharge, Spark** — An electric discharge effected by means of a spark.

A disruptive discharge. (See *Discharge, Disruptive*.)

**Discharge, Tesla** — An exceedingly high frequency discharge.

The Tesla discharge is so named after its discoverer, Nikola Tesla.

**Dish, Chafing, Electric** — An electrically heated chafing dish.

An electric heater is applied to an ordinary chafing dish, so as to permit the electrical heating to take the place of ordinary heating.

A form of electrically heated chafing dish is shown in Fig. 572, and will be readily understood from inspection. (See *Heater, Electric*.)



Fig. 572. Electric Chafing Dish.

**Disruptive Strength of Dielectric**.—(See Appendix—*Dielectric, Disruptive Strength of*.)

**Dissonance, Electric** — Electric disagreement.

Two alternating currents are in electric dissonance when their periods are different. The term electric dissonance is employed in contradistinction to electric consonance.

**Distance, Striking** — The distance through which a disruptive discharge will pass. (See *Discharge, Disruptive*.)

**Distance, Striking, for Various Substances** — Tables of Steinmetz give the following values for the striking distances of various mediums under certain circumstances.

$\delta$  IN MILLICENTIMETRES,  $V$  IN KILO-VOLTS.

Air.....	$\delta = \delta \left( e^{-\frac{1}{2} \frac{V}{V_0}} - \frac{1}{2} \frac{V}{V_0} + 1 \right) - 24 \frac{V}{V_0} + 1.2 \frac{V^2}{V_0^2} \dots$	.18	$\angle \frac{V}{V_0} \angle$
Mica.....	$\delta = .26 \frac{V}{V_0} - .005 \frac{V^2}{V_0^2} \dots$	.8	$\angle \frac{V}{V_0} \angle$
Vulcanized Fibre.....	$\delta = .7 .26 \frac{V}{V_0} - .2 .3 \frac{V^2}{V_0^2} \dots$	8.8	$\angle \frac{V}{V_0} \angle$
Dry Wood Fibre.....	$\delta = .7 .26 \frac{V}{V_0} \dots$	8.8	$\angle \frac{V}{V_0} \angle$
Paraffined Paper.....	$\delta = .3 \frac{V}{V_0} \dots$	6.9	$\angle \frac{V}{V_0} \angle$
Molten Paraffin, 65° C.....	$\delta = .22 .4 \frac{V}{V_0} \dots$	3.9	$\angle \frac{V}{V_0} \angle$
Boiled Linseed Oil, 22° C.....	$\delta = .22 .5 \frac{V}{V_0} \dots$	7.6	$\angle \frac{V}{V_0} \angle$
Turpentine Oil.....	$\delta = .22 .7 \frac{V}{V_0} \dots$	7.1	$\angle \frac{V}{V_0} \angle$
Copal Varnish.....	$\delta = .22 \frac{V}{V_0} \dots$	9.7	$\angle \frac{V}{V_0} \angle$
Crude Lubricating Oil.....	$\delta = .22 \frac{V}{V_0} \dots$	4.4	$\angle \frac{V}{V_0} \angle$
Vulcanite.....	$\delta = .22 \frac{V}{V_0} \dots$	4.0	$\angle \frac{V}{V_0} \angle$
Asbestos Paper.....	$\delta = .22 \frac{V}{V_0} \dots$	9.7	$\angle \frac{V}{V_0} \angle$
Crawling discharge over surface of Mica.....	$\delta = .22 \frac{V}{V_0} - .2 \frac{V^2}{V_0^2} \dots$	4.3	$\angle \frac{V}{V_0} \angle$

In the above table  $\delta$  equals the thickness of the dielectric in milli-centimetres, or thousandths of a cm.;  $e$  equals the Napierian base, and  $V$  equals the potential difference in kilo-volts.

The last column gives the lowest and highest values of  $V$  in the experiments on the different materials.

The following table gives the data concerning a disruptive discharge through air:

TABLE L.—DISRUPTIVE DISCHARGE THROUGH AIR.

$$\delta = \delta \left( e^{-\frac{1}{2} \frac{V}{V_0}} - \frac{1}{2} \frac{V}{V_0} + 1 \right) - 24 \frac{V}{V_0} + 1.2 \frac{V^2}{V_0^2}$$

Maximum Potential Difference in Kilo-Volts.	Spacing Distance observed in Milli-centimetres.	Spacing Distance calculated in Milli-centimetres.	Spacing Distance calculated in Milli-centimetres.	Difference, $\delta - \delta_{calc. obs.}$	Difference in per cent. of calc.
$V$	$\delta$	$\delta_{calc.}$	$\delta_{calc.}$	$\delta$	%
1.0	1.0	1.0	1.0	0	0
1.1	1.1	1.1	1.1	0	0
1.2	1.2	1.2	1.2	0	0
1.3	1.3	1.3	1.3	0	0
1.4	1.4	1.4	1.4	0	0
1.5	1.5	1.5	1.5	0	0
1.6	1.6	1.6	1.6	0	0
1.7	1.7	1.7	1.7	0	0
1.8	1.8	1.8	1.8	0	0
1.9	1.9	1.9	1.9	0	0
2.0	2.0	2.0	2.0	0	0
2.1	2.1	2.1	2.1	0	0
2.2	2.2	2.2	2.2	0	0
2.3	2.3	2.3	2.3	0	0
2.4	2.4	2.4	2.4	0	0
2.5	2.5	2.5	2.5	0	0
2.6	2.6	2.6	2.6	0	0
2.7	2.7	2.7	2.7	0	0
2.8	2.8	2.8	2.8	0	0
2.9	2.9	2.9	2.9	0	0
3.0	3.0	3.0	3.0	0	0
3.1	3.1	3.1	3.1	0	0
3.2	3.2	3.2	3.2	0	0
3.3	3.3	3.3	3.3	0	0
3.4	3.4	3.4	3.4	0	0
3.5	3.5	3.5	3.5	0	0
3.6	3.6	3.6	3.6	0	0
3.7	3.7	3.7	3.7	0	0
3.8	3.8	3.8	3.8	0	0
3.9	3.9	3.9	3.9	0	0
4.0	4.0	4.0	4.0	0	0
4.1	4.1	4.1	4.1	0	0
4.2	4.2	4.2	4.2	0	0
4.3	4.3	4.3	4.3	0	0
4.4	4.4	4.4	4.4	0	0
4.5	4.5	4.5	4.5	0	0
4.6	4.6	4.6	4.6	0	0
4.7	4.7	4.7	4.7	0	0
4.8	4.8	4.8	4.8	0	0
4.9	4.9	4.9	4.9	0	0
5.0	5.0	5.0	5.0	0	0
5.1	5.1	5.1	5.1	0	0
5.2	5.2	5.2	5.2	0	0
5.3	5.3	5.3	5.3	0	0
5.4	5.4	5.4	5.4	0	0
5.5	5.5	5.5	5.5	0	0
5.6	5.6	5.6	5.6	0	0
5.7	5.7	5.7	5.7	0	0
5.8	5.8	5.8	5.8	0	0
5.9	5.9	5.9	5.9	0	0
6.0	6.0	6.0	6.0	0	0
6.1	6.1	6.1	6.1	0	0
6.2	6.2	6.2	6.2	0	0
6.3	6.3	6.3	6.3	0	0
6.4	6.4	6.4	6.4	0	0
6.5	6.5	6.5	6.5	0	0
6.6	6.6	6.6	6.6	0	0
6.7	6.7	6.7	6.7	0	0
6.8	6.8	6.8	6.8	0	0
6.9	6.9	6.9	6.9	0	0
7.0	7.0	7.0	7.0	0	0
7.1	7.1	7.1	7.1	0	0
7.2	7.2	7.2	7.2	0	0
7.3	7.3	7.3	7.3	0	0
7.4	7.4	7.4	7.4	0	0
7.5	7.5	7.5	7.5	0	0
7.6	7.6	7.6	7.6	0	0
7.7	7.7	7.7	7.7	0	0
7.8	7.8	7.8	7.8	0	0
7.9	7.9	7.9	7.9	0	0
8.0	8.0	8.0	8.0	0	0
8.1	8.1	8.1	8.1	0	0
8.2	8.2	8.2	8.2	0	0
8.3	8.3	8.3	8.3	0	0
8.4	8.4	8.4	8.4	0	0
8.5	8.5	8.5	8.5	0	0
8.6	8.6	8.6	8.6	0	0
8.7	8.7	8.7	8.7	0	0
8.8	8.8	8.8	8.8	0	0
8.9	8.9	8.9	8.9	0	0
9.0	9.0	9.0	9.0	0	0
9.1	9.1	9.1	9.1	0	0
9.2	9.2	9.2	9.2	0	0
9.3	9.3	9.3	9.3	0	0
9.4	9.4	9.4	9.4	0	0
9.5	9.5	9.5	9.5	0	0
9.6	9.6	9.6	9.6	0	0
9.7	9.7	9.7	9.7	0	0
9.8	9.8	9.8	9.8	0	0
9.9	9.9	9.9	9.9	0	0
10.0	10.0	10.0	10.0	0	0
Average.....				$\pm 0.7$	$\pm 4.2$

Distant Battery.—(See Appendix—Rectary, Distance.)

Distortion of Magnetic Field.—(See Appendix—Field Magnetic, Distortion of.)

**Distributing Board.**—(See Appendix—*Board, Distributing.*)

**Distributing Brushes of Electric Motor.**—(See Appendix—*Brushes, Distributing, of Electric Motor.*)

**Distributing Switch Board.**—(See Appendix—*Board, Distributing Switch.*)

**Distribution of Complex Lamellar Magnetism.**—(See Appendix—*Magnetism, Complex Lamellar, Distribution of.*)

**Disturbance, Magnetic** — —A term sometimes employed for the temporary variations in the intensity of the earth's magnetism caused by a magnetic storm.

**Divided Touch.**—(See Appendix—*Touch, Divided.*)

**Door Trigger.**—(See Appendix—*Trigger, Door.*)

**Dot-and-Dash Code.**—(See Appendix—*Code, Dot-and-Dash.*)

**Double Block, Duplex.**—(See Appendix—*Block, Double Duplex.*)

**Double-Bronze Wire.**—(See Appendix—*Wire, Double-Bronze.*)

**Double-Contact Push.**—(See Appendix—*Push, Double-Contact.*)

**Double-Contact Push Button.**—(See Appendix—*Button, Push, Double-Contact.*)

**Double-Current Telegraphic Working.**—(See Appendix—*Working, Double-Current Telegraphic.*)

**Double-Curve Pull-Off.**—(See Appendix—*Pull-Off, Double-Curve.*)

**Double-Curve Trolley Hanger.**—(See Appendix—*Hanger, Double-Curve Trolley.*)

**Double Liquid Voltaic Cell.**—(See Appendix—*Cell, Double Liquid.*)

**Double-Pole Cut-Out.**—(See Appendix—*Cut-Out, Double-Pole.*)

**Double-Wire System for Electric Light Leads.**—(See Appendix—*Leads, Double-Wire System for Electric Light.*)

**Drifting of Zero Point.**—A term frequently employed in place of shifting of zero point. (See Appendix—*Shifting of Spot of Light.*)

**Drift of Needle.**—(See Appendix—*Needle, Drift of.*)

**Drill, Electric Diamond** — —A diamond drill driven by electric power.

**Drill, Electro-Percussion** — —A drill for quarrying or mining purposes, in which the reciprocating motion is obtained by sending alternately a current through a pair of solenoids of which the drill stock forms the core.

**Drill, Electro-Reciprocating** — —An electro-percussion drill. (See Appendix—*Drill, Electro-Percussion.*)

**Drop Relay-Contact.**—(See Appendix—*Contact, Drop-Relay.*)

**Drop Trolley.**—(See Appendix—*Trolley, Drop.*)

**Dry Battery.**—(See Appendix—*Battery, Dry.*)

**Dry Gelatine Cell.**—(See Appendix—*Cell, Dry Gelatine.*)

**Duplex Balance.**—(See Appendix—*Balance, Duplex.*)

**Duplex Telegraph.**—(See Appendix—*Telegraph, Duplex.*)

**Duplex Telephony.**—(See Appendix—*Telephony, Duplex.*)

**Dust, Electrical Aggregation of, in Dust-Laden Air** — —A coalescence of a great number of separate particles of dust, in dust-laden air, by means of the action of an electrical brush discharge.

If a brush or convection discharge be passed through dust or smoke-laden air, contained for purposes of observation in a glass globe, the electrical aggregation of the particles of dust or smoke rapidly clears the air. This method is practically employed in the manufacture of lamp-black.

**Dyad Atom.**—(See Appendix—*Atom, Dyad.*)

**Dynamic Multiplier.**—(See Appendix—*Multiplier, Dynamic.*)

**Dynamics.**—That branch of mechanics

which treats of the action of a force in producing motions or pressures.

**Dynamo-Electric Machine for Electro-Plating.**—(See Appendix—*Machine, Dynamo-Electric, for Electro-Plating.*)

**Dynamo, Idle Wire of** — (See Appendix—*Wire, Idle, of Armature of Dynamo.*)

**Dynamometer, Electro, Differential** —  
—A double dynamometer with the moving coils rigidly connected and oppositely influenced, so that the movement of the suspension system can be reduced to zero by electrical adjustments when the instrument is under operation.

**Dynamo, Motor** — (See Appendix—*Motor, Dynamo.*)

**Dynamo or Motor Frame.**—(See Appendix—*Frame, Dynamo or Motor.*)

**Dynamo Standards.**—(See Appendix—*Standards, Dynamo.*)

**Dynamos Coupled in Potential Series.**—(See Appendix—*Series, Potential, Dynamos Coupled in.*)

**Dynamotor.**—A continuous current transformer.

A term now generally employed for motor-generator. (See *Generator, Motor.*)

A motor-dynamo, or motor-generator, is practically a dynamo driven by means of an electric current. The motor-dynamo consists of two distinct or separate armatures placed on the same shaft, or two separate armature windings placed on the same core. On sending the current through one armature or winding it acts as a motor and turns the shaft, thus producing current in the other armature or winding. Such a machine is sometimes called a rotary transformer, though this name is preferably limited to a machine containing only a single armature, which acts as a generator and motor armature. (See *Transformer, Constant Current.*)

Such a machine is employed for transforming continuous currents into continuous currents of different potential, or for transforming alternating or polyphase currents into continuous currents, or *vice versa*.

**Dyne : cm.**—An abbreviation proposed for dyne-centimetre, the C. G. S. unit of moment of couple.

**Dyne : cm<sup>2</sup>.**—An abbreviation proposed for dyne per square centimetre, the C. G. S. unit of pressure.

## E

**E.**—A symbol proposed for electromotive force.

The defining equation is  $E = RC$ .

**e.**—A symbol proposed for difference of potential.

The defining equation is  $e = rC$ .

**E. H. P.**—A contraction for electrical horsepower.

**Earth, Bad** — —A term sometimes employed for a ground or connection to earth, the electric resistance of which is comparatively high. (See *Earth or Ground.*)

**Earth Cell.**—(See Appendix—*Cell, Earth.*)

**Earth, Good** — —A term sometimes employed for a ground or connection to earth,

the electric resistance of which is comparatively low. (See *Earth or Ground.*)

**Earthed.**—Connected to ground or earth.

**Easement.**—A permit, obtained from the owner of a property, for the erection of poles or attachments for telephonic, telegraphic or other electric lines.

**Effect, Page** — —The faint sounds produced when a piece of iron is rapidly magnetized and demagnetized.

A faint click is produced when a bar of iron is magnetized or demagnetized. When, therefore, such a bar undergoes rapid magnetization and demagnetization these separate sounds link themselves into a continuous musical note, thus producing what is known as the Page effect. In the



larger masses of iron employed in transformer cores and alternator armatures, the Page effect sometimes rises to a loud humming noise.

**Effects of Temperature on the Electric Resistance of Metals.**—(See Appendix—*Resistance, Electric, of Metals, Effect of Temperature on.*)

**Effective Current.**—(See Appendix—*Current, Effective.*)

**Effective Starting Current of Motor.**—(See Appendix—*Current, Effective Starting, of Motor.*)

**Efficiency of Electric Lamp.**—(See Appendix—*Lamp, Electric, Efficiency of.*)

**Efficiency of Electric Motor.**—(See Appendix—*Motor, Efficiency of Electric.*)

**Efficiency of Radiation.**—(See Appendix—*Radiation, Efficiency of.*)

**Efficiency of Secondary Battery.**—(See Appendix—*Battery, Secondary, Efficiency of.*)

**Effluvia, Electric** — —A term employed in the early history of electricity for supposed effluvia proceeding from an electrified body and causing electrical phenomena.

**Effluvia, Magnetic** — —A term employed in the early history of magnetism for assumed, imponderable effluvia which were supposed to be given off by magnets.

The doctrine of magnetic effluvia may be regarded as a forerunner of the doctrine of lines of magnetic force introduced into science by Faraday.

In some of his earlier writings Boyle framed the hypothesis of a magnetic atmosphere, or region surrounding a magnet. He conceived the idea that magnetic effluvia, emitted from one of the poles of the magnet, passed through the space surrounding the magnet and re-entered it at its other pole. As will be seen, this conception closely resembles the modern conception concerning the flow of lines of magnetic force, or of magnetic flux.

**Egg, Electric** — —A term formerly employed for an egg-shaped vessel containing a partial vacuum through which an electric discharge is passed for the purpose of obtaining luminous effects.

**Elastance.**—A word proposed for the reciprocal of permittance. (See Appendix—*Permittance.*)

**Elastivity.**—The elastance of a dielectric referred to unit volume.

If the dielectric possesses great permittance it has of course but little elastance.

**Electric Amalgamator.**—(See Appendix—*Amalgamator, Electric.*)

**Electric Anesthesia.**—(See Appendix—*Anesthesia, Electric.*)

**Electric Anemograph.**—(See Appendix—*Anemograph, Electric.*)

**Electric Atmosphere.**—(See Appendix—*Atmosphere, Electric.*)

**Electric Aura.**—(See Appendix—*Aura, Electric.*)

**Electric Broiler.**—(See Appendix—*Broiler, Electric.*)

**Electric Casting.**—(See Appendix—*Casting, Electric.*)

**Electric Chafing-Dish.**—(See Appendix—*Dish, Chafing, Electric.*)

**Electric Chronometer.**—(See Appendix—*Chronometer, Electric.*)

**Electric Clamp Attachment.**—(See Appendix—*Attachment, Electric Clamp.*)

**Electric Coil Heater.**—(See Appendix—*Heater, Coil, Electric.*)

**Electric Conflict.**—(See Appendix—*Conflict, Electric.*)

**Electric Deck-Planer.**—(See Appendix—*Planer, Electric Deck.*)

**Electric Dissonance.**—(See Appendix—*Dissonance, Electric.*)

**Electric Door-Trip.**—(See Appendix—*Trip, Door, Electric.*)

**Electric Effluvia.**—(See Appendix—*Effluvia, Electric.*)

**Electric Egg.**—(See Appendix—*Egg, Electric.*)

**Electric Escapement.**—(See Appendix—*Escapement, Electric.*)

**Electric Excitation.**—(See Appendix—*Excitation, Electric.*)

**Electric Flat-Iron.**—(See Appendix—*Flat-Iron, Electric.*)

**Electric Fluid.**—(See Appendix—*Fluid, Electric.*)

**Electric Forge.**—(See Appendix—*Forge, Electric.*)

**Electric Glue-Pot.**—(See Appendix—*Glue-Pot, Electric.*)

**Electric Gnomon.**—(See Appendix—*Gnomon, Electric.*)

**Electric Harpoon.**—(See Appendix—*Harpoon, Electric.*)

**Electric Horology.**—(See Appendix—*Horology, Electric.*)

**Electric Hummer.**—(See Appendix—*Hummer, Electric.*)

**Electric-Light Bath.**—(See Appendix—*Bath, Electric-Light.*)

**Electric Machine Tool.**—(See Appendix—*Tool, Electric Machine.*)

**Electric Matter.**—(See Appendix—*Matter, Electric.*)

**Electric Meteorograph.**—(See Appendix—*Meteorograph, Electric.*)

**Electric Meteorology.**—(See Appendix—*Meteorology, Electric.*)

**Electric Mining.**—(See Appendix—*Mining, Electric.*)

**Electric Pendulum.**—(See Appendix—*Pendulum, Electric.*)

**Electric Photo-Micrography.** (See Appendix—*Photo-Micrography, Electric.*)

**Electric Pocket Gauge.**—(See Appendix—*Gauge, Electric Pocket.*)

**Electric Pressure.**—(See Appendix—*Pressure, Electric.*)

**Electric Radiation.**—(See Appendix—*Radiation, Electric.*)

**Electric Radiator.**—(See Appendix—*Radiator, Electric.*)

**Electric Rail Bond.**—(See Appendix—*Bond, Electric Rail.*)

**Electric Residue.**—(See Appendix—*Residue, Electric.*)

**Electric Spark.**—(See Appendix—*Spark, Electric.*)

**Electric Stopper Lamp.**—(See Appendix—*Lamp, Electric Stopper.*)

**Electric Stove-Plate.**—(See Appendix—*Stove-Plate, Electric.*)

**Electric Telegraph.**—(See Appendix—*Telegraph, Electric.*)

**Electric Tourniquet.**—(See Appendix—*Tourniquet, Electric.*)

**Electric Wand.**—(See Appendix—*Wand, Electric.*)

**Electric Windmill.**—(See Appendix—*Windmill, Electric.*)

**Electrical Aggregation of Dust in Dust-Laden Air.**—(See Appendix—*Dust, Electrical Aggregation of, in Dust-Laden Air.*)

**Electrical Aggregation of Raindrops.**—(See Appendix—*Raindrops, Electrical Aggregation of.*)

**Electrical Baking Oven.**—(See Appendix—*Oven, Baking, Electrical.*)

**Electrical Bombardment Lamp.**—(See Appendix—*Lamp, Bombardment, Electrical.*)

**Electrical Coking.**—(See Appendix—*Coking, Electrical.*)

**Electrical Equivalent of Heat.** (See Appendix—*Heat, Electrical Equivalent of.*)

**Electrical Harmonics.**—(See Appendix—*Harmonics, Electrical.*)

**Electrical Stimulus of Nerve.**—(See Appendix—*Stimulus, Electrical, of Nerve.*)

**Electrically Illumined Buoy.**—(See Appendix—*Buoy, Electrically Illumined.*)

**Electrically Tuned System.**—(See Appendix—*System, Electrically Tuned.*)

**Electricity, Reversible Heating Effect of** — — — A term sometimes employed in place of the Peltier effect. (See *Effect, Peltier.*)

An effect of this character is called reversible, because when the current is passed across an electro-thermal junction in one direction, heat is produced, while if it is passed in the opposite direction, cold is produced.

**Electricity, Spontaneous** — — A term formerly employed for the electricity produced by the melting of sulphur.

This term is, of course, not employed at present, since electricity can never, properly speaking, be produced spontaneously.

**Electrification, Negative** — — The charging of a body with negative electricity.

The negative charge.

**Electrification, Positive** — — The charging of a body with positive electricity.

The positive charge.

**Electriphorous**.—A word proposed for anything capable of bearing or transmitting electricity.

This word is unnecessary and its use should not be encouraged.

**Electrize, To** — — To charge or electrify a body.

The word corresponds to magnetize, to render a body magnetic or endow it with magnetic properties.

The word is sometimes spelled electrise.

**Electrizer**.—That which electrizes or charges with electricity.

**Electro-Biologist**.—(See Appendix—*Biologist, Electro.*)

**Electro-Bioscopist**. — (See Appendix—*Bioscopist, Electro.*)

**Electro-Chemical Accumulator**.—(See Appendix—*Accumulator, Electro-Chemical.*)

**Electro-Chemical Decomposition**.—(See Appendix—*Decomposition, Electro-Chemical.*)

**Electro-Chemical Filtration**.—(See Appendix—*Filtration, Electro-Chemical.*)

**Electro-Chronometric Counter**.—(See Appendix—*Counter, Electro-Chronometric.*)

**Electro-Compound Magnet**.—(See Appendix—*Magnet, Electro-Compound.*)

**Electro-Culture**.—Stimulating the growth of vegetation by means of electricity.

The term is a bad one, since it should equally apply to a similar stimulation of animal growth.

The term electro-culture has been proposed to characterize the electric stimulation of vegetation, which consists essentially in sending an electric current either through the plant whose growth is to be stimulated, or through the earth near the plant.

In an experiment recently tried in France, a kilogramme of potatoes placed in the path of a weak current, under conditions exactly similar to those of an equal weight of potatoes uninfluenced by the electric current, produced 21 kilogrammes of healthy tubers as compared to 13½ kilogrammes of non-electrically stimulated tubers.

These experiments developed the fact that if a quantity of manure be planted near the positive pole of an electric source, the assimilable parts of the manure are transported or carried towards the negative pole.

The phenomena would, therefore, appear to be connected with those of electric osmose or cataphoresis. (See *Osmose, Electric. Cataphoresis.*)

**Electrode, Cataphoric** — — In electro-therapeutics an electrode impregnated with the medicament it is desired to introduce into the part to be treated by cataphoric medication. (See Appendix—*Medication, Cataphoric.*)

**Electro-Deposition**.—A term sometimes employed for electric deposition. (See *Metal-lurgy, Electro.*)

**Electro-Dynamic Balance**.—(See Appendix—*Balance, Electro-Dynamic.*)

**Electro-Dynamic Interrupter**.—(See Appendix—*Interrupter, Electro-Dynamic.*)

**Electro-Dynamic Rotation**.—(See Appendix—*Rotation, Electro-Dynamic.*)

**Electro-Dynamic Whirls**.—(See Appendix—*Whirls, Electro-Dynamic.*)

**Electro-Genesis**.—A word proposed for the production of electricity.

**Electro-Genic**.—Producing electricity.

**Electro-Gilding**.—(See Appendix—*Gilding, Electro.*)

**Electrograph**.—A curve produced by a recording electrometer.

**Electrography**.—A word proposed for that branch of science which treats of electricity.

A word proposed for the copying of fine engraving on copper or steel by means of electro-deposition.

It will be seen that the word *electrography* has been proposed for two entirely distinct senses. The first use of the word would appear to be entirely unjustifiable.

**Electro-Kinetic Energy.**—(See Appendix—*Energy, Electro-Kinetic.*)

**Electro-Lithotripsy.**— (See Appendix—*Lithotripsy, Electro.*)

**Electrolization.**—The act of being electrolyzed.

The word is sometimes spelled *electrolisation*.

**Electrologist.**—An electrician.

The use of this word is entirely unnecessary.

**Electrolysis, Counter - Electromotive Force of** — —The counter-electromotive force produced in a plating bath or a secondary cell by electrolysis.

**Electrolyte.**—The exciting liquid in a voltaic cell.

A compound liquid which is separable into its constituent ions by the passage of electricity through it.

**Electrolytic Accumulator.**—(See Appendix—*Accumulator, Electrolytic.*)

**Electrolytic Corrosion.** (See Appendix—*Corrosion, Electrolytic.*)

**Electrolytic Meter.**—(See Appendix—*Meter, Electrolytic.*)

**Electro-Magnetic Cut-Out.**—(See Appendix—*Cut-Out, Electro-Magnetic.*)

**Electro-Magnetic Gyroscope.**—(See Appendix—*Gyroscope, Electro-Magnetic.*)

**Electro-Magnetic Interference.**— (See Appendix—*Interference, Electro-Magnetic.*)

**Electro-Magnetic Multiplier.**—(See Appendix—*Multiplier, Electro-Magnetic.*)

**Electro-Magnetic Separator.**—(See Appendix—*Separator, Electro-Magnetic.*)

**Electro-Magnetic Sorter.**—(See Appendix—*Sorter, Electro-Magnetic.*)

**Electro-Magnetic Telegraph.**—(See Appendix—*Telegraph, Electro-Magnetic.*)

**Electro-Metallurgical Burnt Deposit.**—(See Appendix—*Deposit, Electro-Metallurgical Burnt.*)

**Electrometer, Heterostatic** — —An electrometer in which the electrification to be tested is not the only electrification employed. (See *Heterostatic.*)

**Electrometer, Idiostatic** — —An electrometer in which the electrification to be tested is the only electrification employed. (See *Idiostatic.*)

**Electrometer, Long-Range** — —A form of attracted-disc electrometer in which the range of the scale is comparatively long.

**Electrometer, Repulsion** — —An electrometer in which the differences of potential are measured by means of the repulsion existing between two similarly charged bodies.

Coulomb's torsion balance is an instrument of this class. A gold-leaf electrometer, when arranged so that the amount of deviation can be readily measured, is also a repulsion electrometer.

**Electrometer, Symmetrical** — —A form of electrometer in which the needle is unaffected when it is placed symmetrically as regards the deflecting segments.

A quadrant electrometer is a form of symmetrical electrometer.

**Electrometer, Thermo** — —A term sometimes employed for an electric thermometer.

This use of the term probably arose from the fact that such an instrument may be employed to measure roughly the difference of potential between points between which a spark passes.

**Electrometer Voltmeter.**—(See Appendix—*Voltmeter, Electrometer.*)

**Electrometric.**—Of or pertaining to an electrometer.

**Electromotive Force, Transformation of** — — (See Appendix—*Transformation, as of Electromotive Force.*)

**Electronome.**—A term proposed for a measurer of electricity.

This term is not only unnecessary, but is devoid of any precise meaning and may serve as an



illustration of the thoughtless manner in which electric words are proposed.

**Electropath.**—One skilled in the art of electro-therapy.

**Electropathy.**—A word proposed for the treatment of disease by means of electricity.

The word electro-therapy or electro-therapeutics is generally used.

**Electro-Percussion Drill.**—(See Appendix—*Drill, Electro-Percussion.*)

**Electrophone.**—A word proposed by Ader for a form of telephone employing carbon contacts.

**Electro-Physiologist.**—(See Appendix—*Physiologist, Electro.*)

**Electro-Potential Energy.**—(See Appendix—*Energy, Electro-Potential.*)

**Electro-Puncturation.**—(See Appendix—*Puncturation, Electro.*)

**Electro-Reciprocating Drill.**—(See Appendix—*Drill, Electro-Reciprocating.*)

**Electroscope, Semaphoric** — —A name sometimes given to Henley's quadrant electroscope. (See *Electroscope, Quadrant, Henley's.*)

**Electroscopic Gauge.**—(See Appendix—*Gauge, Electroscopic.*)

**Electrostatic Aurora.**—(See Appendix—*Aurora, Electrostatic.*)

**Electrostatic Corona.**—(See Appendix—*Corona, Electrostatic.*)

**Electrostatic Influence.**—(See Appendix—*Influence, Electrostatic.*)

**Electrostatic Motion.**—(See Appendix—*Motion, Electrostatic.*)

**Electrostatic Motor.**—(See Appendix—*Motor, Electrostatic.*)

**Electrostatic Strain.**—(See Appendix—*Strain, Electrostatic.*)

**Electro-Steeling.**—(See Appendix—*Steeling, Electro.*)

**Electro-Stereotype.**—(See Appendix—*Stereotype, Electro.*)

**Electro-Synthesis.**—(See Appendix—*Synthesis, Electro.*)

**Electro-Thermaney.**—(See Appendix—*Thermaney, Electro.*)

**Electro-Thermotic.**—(See Appendix—*Thermotic, Electro.*)

**Electro-Tint.** (See Appendix—*Tint, Electro.*)

**Electrotome.**—A term formerly applied to an automatic contact breaker which vibrated with sufficient rapidity to produce a musical note. (See *Contact Breaker, Automatic.*)

**Electro-Tonicity.**—(See Appendix—*Tonicity, Electro.*)

**Electro, Turtle-Back** — —An electrotype curved so as to be capable of being employed in the cylinder of a rotary newspaper press.

**Element of Battery.**—A term sometimes applied to a single electric source or a battery of sources.

**Element of Voltaic Battery.**—A term sometimes applied to a single cell of a voltaic battery.

The term element is properly applied to a single complete voltaic cell only when such a cell forms one of a number of cells so connected in a battery as to form a single electric source.

It would appear that the use of the word element in the case of a single voltaic cell, whether connected with the battery or not, is inadvisable.

**Elliptical Rotary Magnetization.**—(See Appendix—*Magnetization, Elliptical Rotary.*)

**Elongation, Maximum Negative** — — The position of a vibrating body when it is at the extremity of its path on the negative side.

**Elongation, Maximum Positive** — — The position of a vibrating body when it is at the extremity of its path on the positive side.

**Emission, Selective** — —A selective radiation. (See Appendix—*Radiation, Selective.*)

**End-to-End Joint.**—(See Appendix—*Joint, End-to-End.*)



**Endeavour, Voltaic** — —A term sometimes employed in place of electric osmose. (See *Osmose, Electric*.)

**Energetics**.—That branch of mechanics which treats of the transfer, transformation or modification of energy.

**Energy, Cubic** — —A term sometimes employed for volumetric energy. (See Appendix—*Energy, Volumetric*.)

**Energy, Electro-Kinetic** — —Electric energy that is actually engaged in doing work. (See *Energy, Kinetic*.)

**Energy, Electro-Potential** — —Electric energy possessing the power of, but not actually doing, work. (See *Energy, Potential*.)

**Energy, Specific** — —Volumetric energy.

**Energy, Volumetric** — —A term proposed by Hospitalier for a quantity equal to the work divided by the volume.

**Energy, Volumetric, C. G. S. Unit of** — —An erg per cubic centimetre.

**Entering Current of Telegraphic Circuit**.—(See Appendix—*Current, Entering, of Telegraphic Circuit*.)

**Epoch**.—The time reckoned in the case of a vibrating body from the point of reckoning to the point of maximum positive elongation.

**Equalising Wires**.—(See Appendix—*Wires, Equalising*.)

**Equatorial Region of Magnet**.—(See Appendix—*Region, Equatorial, of Magnet*.)

**Ergometer**.—A term proposed for an instrument for measuring the amount of work done by a machine.

This would more properly be called : meter. The word, however, is seldom used.

**Erg : a**.—An abbreviation proposed per second, the C. G. S. unit of power.

**Error, Heeling, of Mariner's Compass** — —The error in deviation of the netic needle produced by that portion induced and permanent magnetism iron in a ship brought into action by tilting or heeling of the vessel.

**Escape**.—A term employed in telegraphy for leakage of the current from the line or conductor, from the effect of insulation or faulty insulation, or from contact line with wet buildings or other uninsulated bodies.

**Escapement, Electric** — —An electrically actuated clock escapement.

**Evanescence, Telegraphic Signal**. Appendix—*Signal, Telegraphic, Evanescent*.)

**Exciter, Direct Current** — —A source of direct current, generally a direct current dynamo, employed for exciting the field magnets of an alternating current dynamo.

**Excitation, Electric** — —The production of electrification by any means.

**Exhausted Plates of Storage Cell**. Appendix—*Plates, Exhausted, of Storage Cell*.)

**Extension Bell**.—(See Appendix—*Extension*.)

**External Magnetic Circuit**.—(See Appendix—*Circuit, Magnetic, External*.)

**External Magnetic Field**.—(See Appendix—*Field, Magnetic, External*.)

## F

**F**.—A symbol proposed for farad, the practical unit of capacity.

**F**.—A symbol proposed for force.

The defining equation is  $F = M \times A$ . The same symbol is also proposed for farad.

**F**.—A symbol proposed for magnetomotive force.

The defining equation is  $\mathcal{F} = 4\pi NI$ .

**F. M.**.—A contraction sometimes employed for field magnets.

**Fac-Simile Telegraph**.—(See Appendix—*Telegraph, Fac-Simile*.)

**Factor, Power** — —The factor greater than unity, which must be applied to the

parent activity in an alternating current circuit as obtained by the product of the volts and the ampères, in order to obtain the true activity.

With sinusoidal currents and electromotive forces, the power factor is also equal to the cosine of the angle of lag in the current before or behind the pressure.

**Feedback Indicator.**—(See Appendix—*Indicator, Feedback.*)

**Farad, International** — —The value of the international farad adopted by the Chicago Congress of 1893 as equal to the capacity of a conductor charged to a potential of one international volt by one international coulomb of electricity.

**Faradic Coil.**—(See Appendix—*Coil, Faradic.*)

**Faradism.**—A word sometimes employed for faradization.

Faradization would appear to be the preferable word. (See *Faradisation.*)

**Fault, Low Test** — —A term sometimes applied to a fault in an underground cable when the insulation resistance falls below a certain minimum value, say, for example, 5 megohms per 100 volts per mile.

**Fault, Resultant** — —The apparent position and magnitude of a fault in a cable due to the resultant of all its leakage upon the electrical measurements made.

**Feeder Clamp.**—(See Appendix—*Clamp, Feeder.*)

**Feeder Clip.** — (See Appendix — *Clip, Feeder.*)

**Feeder for Trolley Conductor.**—A wire or conductor of low resistance, employed for transmitting electric current directly from the power station to the trolley wire, and serving to maintain the potential at the point of junction.

**Ferro-Magnetic.**—A word sometimes employed in place of paramagnetic.

**Ferro-Magnetism.**—A word sometimes applied to the magnetism possessed by iron, or, in general, by paramagnetic substances. (See *Paramagnetic.*)

**Field Coils of Dynamo.**—(See Appendix, *Coils, Field, of Dynamo.*)

**Field, Magnetic, Distortion of** — —A change in the direction or grouping of lines of magnetic force, in the field of a dynamo-electric machine or electric motor, produced by the reaction of the armature, or the magneto-motive force of the armature current.

This distortion of the field renders it necessary to give a lead to the collecting or distributing brushes. (See *Lead, Angle of. Lead of Brushes of Dynamo-Electric Machine.*)

**Field, Magnetic, External** — —That portion of a magnetic field which lies outside the magnet or external to it. (See *Field, Magnetic.*)

**Field, Magnetic, Internal** — —That portion of a magnetic field which lies within the magnet.

**Field of Force.**—(See Appendix—*Force, Field of.*)

**Field Plates.**—(See Appendix—*Plates, Field.*)

**Field Spools of Dynamo-Electric Machine.**—(See Appendix, *Spools, Field, of Dynamo-Electric Machine.*)

**Figures, Karsten's** — —A name sometimes given to electric breath figures. (See *Figures, Breath.*)

**Filament, Coked** — —A carbon filament for an incandescent electric lamp that has been subjected to electrical heating in a vacuum, not only until thoroughly freed from its occluded gases, but also until its carbon is changed into a variety of coke.

The coked carbon filament is the invention of Lodyguine. The coking is carried on in a vacuum, the process being continued for about eight seconds after the occluded gases have been driven off.

The carrying off of the occluded gas is effected in the usual manner, and the strength of the current is then increased considerably. Under these circumstances the carbon of the filament becomes changed into a variety of coke.

It is claimed that under the coking process the filament has its permanent or cold resistance greatly decreased until it becomes approximately

of the same value as that of the hot resistance of the filament before it was coked. The process is sometimes carried further than this, depending on the character of the original carbonization.

It is necessary, however, to stop the coking treatment when this point of resistance has been reached, since, if the heating be continued beyond this, the resistance of the filament again rises.

**Filament, Coking of** — —Subjecting a filament to the coking process. (See *Filament, Coked*.)

**Filament, Incandescent** — —A filament that is rendered incandescent by the passage of an electric current. (See *Lamp, Incandescent, Electric Filament of*.)

In other words, a filament is incandescent only while it is actually emitting its own light.

**Filament, Incandescing** — —A filament that can be rendered incandescent by the passage of an electric current. (See *Lamp, Incandescent, Electric Filament of*.)

**Filament, Mounting of** — —A suitable connection for the filament to the leading-in wires inside the chamber of an incandescent electric lamp.

**Filament, Treated Coked** — —A carbon filament the core of which has been electrically coked and whose surface is covered with electrically deposited carbon derived from the decomposition of a hydrocarbon gas or vapor.

**Filtration, Electro-Chemical** — —A term formerly employed in place of electric endosmose. (See *Osmose, Electric. Phenomena, Porret*.)

**Finishing Brushes** — —(See Appendix—*Brushes, Finishing*.)

**Fire Alarm Telegraph** — —(See Appendix—*Telegraph, Fire Alarm*.)

**Fire Glow** — —(See Appendix—*Glow, Fire*.)

**Fittings, Combination, for Chandellers, Brackets, Etc.** — —Fittings that provide for the use of both gas and electricity

**Five-Wire System** — —(See Appendix—*System, Five-Wire*.)

**Flash, Multiple Lightning** — —Several

lightning flashes that apparently come from the same cloud.

Lodge traces the cause of multiple lightning flashes to the same circumstances that produce in a Leyden jar the tendency of the jar to neutralize its charges by overflowing. (See Appendix—*Jar, Leyden, Overflow of*.)

**Flashing** — —A process to which carbons are subjected, in order to give them a uniform electrical resistance throughout their entire length. (See *Carbons, Flashing Process for*.)

**Flat-Iron, Electric** — —An electrically heated flat-iron.

A hollow flat-iron provided with a suitably placed electric heater. (See *Heater, Electric*.)

**Floor Contact** — —(See Appendix—*Contact, Floor*.)

**Fluid, Austral** — —A term formerly employed for the magnetic fluid that was supposed to exist around or emanate from the austral pole of a magnet. (See *Pole, Magnetic Austral*.)

**Fluid, Boreal** — —A term formerly employed for the magnetic fluid that was supposed to exist around or emanate from the boreal pole of a magnet. (See *Pole, Magnetic, Boreal*.)

**Fluid, Electric** — —An assumed fluid which was formerly believed to be the cause of electric excitement.

A belief in electric fluids no longer exists among intelligent electricians.

**Fluid, Magnetic** — —A term formerly employed for an assumed fluid which was believed to cause magnetic phenomena.

The belief in magnetic fluids no longer exists.

**Fluid, Negative** — —A specific fluid which was formerly believed by the advocates of the double-fluid electric hypothesis to be the cause of negative electric excitement. (See Appendix—*Fluid, Positive*.)

A defect of an assumed single electric fluid. (See *Electricity, Single-Fluid Hypothesis of*.)

**Fluid, Positive** — —A specific fluid which was formerly believed by the adherents

double-fluid electric hypothesis to be use of positive electric excitement.

surplusage of an assumed single electric

According to the views of the single-fluid electric hypothesis, positive excitement was supposed due to the surplusage of an assumed single fluid, the negative excitement being as to be due to its deficit. (See *Electricity, Fluid Hypothesis of*.)

**Key Switch.**—(See Appendix—*Key, Flush-Key*.)

**Key, Electric, Transformation of**—— Producing or effecting a change in the of the electromotive force by means of induction coil, transformer or condenser, electric resonance. (See *Transformer*.)

**Key, Electromotive, Alternating**—— Electromotive force periodically passing to zero between positive and negative (See *Current, Alternating*.)

**Key, Electromotive, Conversion of**—— Change in the value of the electromotive force produced by means of an induction transformer or condenser, or by electric resonance. (See *Transformer*.)

**Key, Electromotive, Impressed, Prof. A. I. E. E. Definition for**—— The of the total activity in an electrically circuit to its instantaneous current strength.

**Key, Electromotive, Opposing**—— Sometimes employed for counter-electromotive force. (See *Force, Electromotive, Counter*.)

**Key, Electromotive, Voltaic**—— A sometimes employed for the electromotive force generated at the electrodes of an electrolytic cell, in contradistinction to the counter-electromotive force produced at such electrodes by their polarization.

**Key, Field of**—— The space traversed by the lines of electrostatic magnetic force.

electrostatic field. (See *Field, Electrostatic*.)

magnetic field. (See *Field, Magnetic*.)

**Force, Magne-Crystalline**—— A name proposed by Faraday for the force assumed as the cause producing the change in the nature of the magnetism of certain crystalline bodies in different directions. (See *Action, Magne-Crystalline*.)

**Force, Volta Electromotive**—— An electromotive force produced by means of the voltaic cell. (See *Cell, Voltaic*.)

**Forces, Electromotive, Complex-Harmonic Alternating**—— The electromotive forces producing complex harmonic alternating currents. (See Appendix—*Currents, Complex-Harmonic*.)

**Forge, Electric**—— A forge so arranged that the metals to be subjected to forging can be electrically heated while in place on the forge.

**Formulae, Blavier's**—— The formulæ employed for computing the Blavier test. (See Appendix—*Test, Blavier's*.)

**Formulas.**—Plural of formula.

**Four-Pole Dynamo-Electric Machine.**— (See Appendix—*Machine, Dynamo-Electric, Four-Pole*.)

**Fourth State or Condition of Matter.**— (See Appendix—*Matter, Fourth State or Condition of*.)

**Four-Way Switch.**— (See Appendix—*Switch, Four-Way*.)

**Four-Wire System.**— (See Appendix—*System, Four-Wire*.)

**Frame, Dynamo or Motor**—— A term applied to the iron body of a dynamo or motor, including the pole pieces and standards of the machine, but exclusive of the base plates and bearings. (See *Machine, Dynamo-Electric, Motor, Electric*.)

**Frame, Trolley Base**—— A frame for receiving the standard which supports the trolley pole.

**Franklinism.**—A word sometimes employed for franklinization.

Franklinization would appear to be the preferable word. (See *Franklinization*.)

**Free or Insulated.**—(See Appendix—*Insulated or Free.*)

**Frequencies, Harmonic** — — Frequencies higher than the fundamental, present in complex-harmonic currents. (See Appendix—*Currents, Complex-Harmonic.*)

**Frequencies, Tesla** — — A term employed for exceedingly high frequencies.

The frequencies employed by Tesla amounted to many hundreds of thousands per second.

**Frequency, Fundamental** — — The nominal or lowest frequency of a current which has harmonics.

**Frequency, Vibration** — — A term expressing the number of vibrations per second.

In the case of a musical note the vibration frequency corresponds to the pitch of the note.

**Frog Crossing.**—(See Appendix—*Crossing Frog.*)

**Frost Alarm.**—(See Appendix—*Alarm, Frost.*)

**Full Contact.**—(See Appendix—*Contact, Full.*)

**Full Load.**—(See Appendix—*Load, Full.*)

**Fundamental Frequency.**—(See Appendix—*Frequency, Fundamental.*)

**Fuse, Blowing of** — — A term sometimes employed for the fusing or volatiliza-

tion of a fuse wire or safety plug. (*Fuse, Safety.*)

**Fuse, Blowing Point of** — — The temperature or the current strength at which a fuse blows out or melts.

The exact current strength at which a fuse blows out or melts varies, not only with the temperature of the wire, but also with the material in which the fuse wire is placed in the fuse block, and the nature of the block, its size, whether the current is direct or alternating, etc.

The ratio, which should exist between the carrying capacity of a fuse, and the conditions of the ultimate fusing, will of course depend upon the character of the circuit the fuse is intended to guard. With small currents, such as are employed in electric lighting, a narrow limit may be employed without detriment, but in the case of railway systems, however, a wide margin is necessarily given to the blowing point of a fuse, for the amount of current required for the operation of the systems, near heavy grades, is so much in excess of what is ordinarily employed that a too narrow a limit would be a considerable annoyance would be experienced from the fuse blowing out too frequently.

**Fuse, Safety, Carrying Capacity**

—The current strength a fuse wire can carry without the line it protects becoming dangerously heated.

## G

**g.**—An abbreviation proposed for one gramme, the C. G. S. unit of mass.

**g. cm<sup>2</sup>.**—An abbreviation proposed for gramme centimetre squared, the C. G. S. unit of moment of inertia.

**Galvanic Cell.**—(See Appendix—*Cell, Galvanic.*)

**Galvanic Chain.**—(See Appendix—*Chain, Galvanic.*)

**Galvanic Ring.**—(See Appendix—*Ring, Galvanic.*)

**Galvanist.**—One skilled in the "art of galvanism." (Obsolete.)

The word has no precise meaning, and the word galvanism is employed in two entirely different senses; namely, as current electricity, and as a particular method of applying electricity to the curing of diseases.

**Galvanography.**—The process of making an electrotype.

This word, though good etymologically, is not necessary; moreover, the word electrotype is almost universally employed.

**Galvanography.**—A term proposed for the copying of fine engravings on copper or steel plates by means of electro-deposition.

**Galvano-Magnetic.**—A word proposed for electro-magnetic.



The use of this word is unwarranted and should not be encouraged.

**Galvanometer, Angle of Maximum Sensitiveness of** — — The angle of deflection at which a given small alteration in the strength of the current produces the greatest change in the deflection of the needle.

**Galvanometer, Direct Reading** — — A galvanometer in which the absolute value of the deflection in current strength is obtained directly without the use of tables or curves.

**Galvanometer, Helmholtz** — — A double-ring tangent galvanometer, the two ring coils of which are parallel to each other and are placed on opposite sides of the magnetic needle at such positions that their magnetic field at the needle may be as nearly uniform as possible, and much more nearly uniform than a single coil could produce.

**Galvanometer, Optical** — — A form of galvanometer proposed by Poter based on the magnetic rotary power of liquids. (See *Refraction, Double, Electric*.)

**Galvanometer, Pocket** — — A galvanometer small enough to be readily carried in the pocket.

**Galvanometer Voltmeter.** (See Appendix—*Voltmeter, Galvanometer*.)

**Galvanotonus.** A term proposed by Hinger for the state of tetanus produced in a muscle that has been overstimulated electrically.

**Galvanotropism.**—Movements produced in living organisms by the passage of electricity through them.

The word galvanotropism has been proposed to describe such phenomena as the movements observed in the roots of plants, when placed between two opposite electrodes. The direction of these movements seems to be such as would place the longer axis of the root in the direction of the flow of the current.

**Gap, Air, Shunting** — — An air gap in a circuit placed around a galvanometer or other instrument for the purpose of affording protection to the galvanometer or other instrument from the effects of powerful disruptive discharges.

The inductive resistance of the coil to the rapidly varying oscillatory discharges is so great that the discharges take instead a path through an air gap. Since such an air gap thus shunts the discharge from the galvanometer or other coils, it is called a shunting air gap.

**Gas Cell.**—(See Appendix—*Cell, Gas*.)

**Gas Polarization.**—(See Appendix—*Polarization, Gas*.)

**Gauge, Electric Pocket** — — A gauge for an electric battery or other similar source small enough to be readily carried in the pocket.

**Gauge, Electroscopic** — — A term applied by Gauguin to a form of discharging gold-leaf electroscope. (See *Electroscope, Gold-Leaf*.)

**Gauss, Proposed A. I. E. E. Definition for** — — A practical unit of magnetic intensity, the value of which is equal to one C. G. S. unit; that is, one C. G. S. line per square centimetre.

This unit is a modification of that proposed by a Sub-Committee of the American Institute of Electrical Engineers on the Provisional Programme for the International Electrical Congress, held in Chicago, 1893, on the occasion of the World's Columbian Exposition.

**Generator, Chemical, of Electricity** — — A term sometimes employed in place of a voltaic pile or battery.

This use of the term generator is sanctioned by the similar use of the word in other connections. Of course it will be understood that it is difference of potential and not electricity that is generated.

**Generator, Biphasic** — — A generator which delivers two-phase or diphasic currents.

**Generator, High-Voltage Electro-Magnetic** — — An electro-magnetic generator arranged so as to give a high electromotive force.

**Generator, Polyphase** — — A generator which delivers more than single-phase currents.

The term polyphase is frequently employed only in the sense of greater than diphasic.

**Generator, Railway** — — A dynamo-

electric machine which develops the current employed in systems of electric railways.

**Generator, Self-Compounding Polyphase** — —A polyphase generator whose field magnets are compound-wound.

**Generator, Thermo-Electric** — —A term sometimes employed for a thermo-electric pile. (See *Pile, Thermo-Electric*.)

The term is equally applicable to the pyromagnetic generator.

**Generator, Three-Phase** — —A tri-phase generator. (See Appendix—*Generator, Tri-Phase*.)

The term tri-phase generator would appear to be preferable.

**Generator, Tri-Phase** — —A generator which delivers three-phase or tri-phase currents.

**Generator, Two-Phase** — —A di-phase generator. (See Appendix—*Generator, Di-Phase*.)

The term di-phase generator would appear to be preferable.

**Gilbert**.—A term proposed for the practical unit of magneto-motive force.

A unit of magneto-motive force having the value of the absolute unit or equal to  $\frac{10}{4\pi}$  ampère-turn.

This unit is a modification of that proposed by a Sub-Committee of the American Institute of Electrical Engineers on Provisional Programme for the International Electrical Congress, held in Chicago, in 1893.

**Gilding, Electro** — — Electric gilding. Electro-plating with gold. (See *Gilding, Electric*.)

**Glass Screw Insulator**.—(See Appendix—*Insulator, Glass-Screw*.)

**Globes, Diffusing, for Electric Lights**. — — Globes so constructed as to insure a diffusion of the light.

The diffusion is generally obtained by means of ground glass. In order to avoid the loss of light that attends the use of ground glass, diffusion globes have been made of clear glass furnished with a number of retraction or total internal re-

flecting lenses, in the manner of the well-known Fresnel lens.

**Glory, Aurora** — —A term proposed by Nordenskjöld for an almost constant crown of light, single, double or multiple, which occupies a nearly fixed position in the heavens.

Nordenskjöld describes the aurora glory as follows:

"Our globe, even during a minimum aurora year, is adorned with an almost constant crown of light, single, double, or multiple, whose inner edge was usually, during the winter of 1878-79, at a height of about 0.03 of the radius of the earth (120 miles) above its surface, whose surface was somewhat under the earth's surface, having its centre a little north of the magnetic pole, and which, with a diameter of about 0.32 radius of the earth (about 1,280 miles), extends in a plane perpendicular to the earth's radius which passes through the centre of this luminous ring."

**Glow, Fire** — —A term employed by the ancients for an aurora. (See *Aurora Borealis, Aurora Australis*.)

**Glow Illumination**.—(See Appendix—*Illumination, Glow*.)

**Glow Lamp**.—(See Appendix—*Lamp, Glow*.)

**Glowing of Electric Conductor**.—(See Appendix—*Conductor, Electric, Glowing of*.)

**Glue-Pot, Electric** — —An electrically heated glue-pot.

An electric heater is applied to a glue-pot of ordinary construction. (See *Heater, Electric*.)

**Gnomon, Electric** — —A term formerly applied to a variety of pith ball electrometer.

**Good Earth**.—(See Appendix—*Earth, Good*.)

**Ground Coll**.—(See Appendix—*Coil, Ground*.)

**Ground, Dead** — —A term sometimes applied to a fault or interruption in a telegraphic line in which the escape to earth or ground is so great that it is impossible to operate the line.

Dead earth. (See *Earth, Dead or Total*.)

**Grounding**.—A word sometimes employed

n electro-metallurgy for a preparatory process in burnishing. (See Appendix—*Burnishing*.)

**Grouping System for Electric Light Leads.**—(See Appendix—*Leads, Grouping System for Electric Light*.)

**Guard, Automatic, for Series-Connected Incandescent Lamps** — —A device placed on each series-connected incandescent electric lamp for the purpose of short circuiting

the holder should the lamp filament break.

A film cut-out. (See *Cut-Out, Film*.)

An automatic guard may consist of a sheet of paraffine paper placed between two metallic knobs.

**Gyroscope, Electro-Magnetic** — —A gyroscope driven by an electro-magnet.

**Gyrostatic Action of Dynamos on Ship-board.**—(See Appendix—*Action, Gyrostatic, of Dynamos on Shipboard*.)

## H

**H.**—A symbol used for field intensity.

The defining equation is  $H = \frac{F}{m}$ .

Here F = the force and m the strength of the pole.

**H.**—An abbreviation proposed for henry, the practical unit of mutual induction, self-induction, or inductance.

This abbreviation is seldom used.

**h.**—An abbreviation for hour, one of the practical units of time.

**H.**—A symbol proposed for magnetizing force.

The defining equation is  $H = \frac{4\pi NI}{L}$ .

Where N, is the number of windings, and L, the length of the solenoid generating the magnetizing force.

**HP or HP.**—A contraction for horse-power.

This contraction is universally employed in all English-speaking countries.

**Harmonic Frequencies.**—(See Appendix—*Frequencies, Harmonic*.)

**Harmonic Motion.**—(See Appendix—*Motion, Harmonic*.)

**Harmonic Telegraph.**—(See Appendix—*Telegraph, Harmonic*.)

**Harmonics, Electrical** — —A term sometimes employed in place of the upper harmonic currents generally. (See Appendix—*Currents, Complex-Harmonic*.)

**Harmonics of Current.**—(See Appendix—*Current, Harmonics of*.)

**Harmonics, Weeding-Out of** — —Getting rid of, or removing some or all of the upper harmonic currents from a fundamental harmonic current.

The weeding-out process is generally effected by means of electric resonance. The presence of self-induction or capacity in the circuit has the same effect. It is partly on this account that we cannot yet speak across the Atlantic cable, the upper harmonics of the voice being weeded out more than the lower and made to lag more. (See Appendix—*Harmonics, Weeding-Out of, by Electrical Resonance*.)

**Harmonics, Weeding-Out of, by Electrical Resonance** — —The weeding-out of the upper harmonics of a complex-harmonic current by altering the natural period of the system until it is in unison or in resonance with the fundamental harmonic.

"A resonant circuit," says Pupin, "behaves towards a complex-harmonic electromotive force just the same as an acoustic resonator toward a source of complex sound. It brings out prominently that harmonic with which it is in resonance. To express this numerically, say that the ratio of the amplitude of the fundamental harmonic electromotive force to that of the next higher harmonic (supposing it to be even no higher than an octave) is 2 to 1. Then the circuit can be easily brought into resonance with the fundamental harmonic in such a way as to increase the ratio of the amplitudes of the corresponding simple harmonic currents 60:1. Theoretically (and to a great extent practically also) that ratio can be made anything we please by increasing continually the coefficient of self-induc-

tion and diminishing the capacity without destroying the resonance. In other words, we can, by the proper single tuning, weed out the upper harmonics as much as we please. But, as will be indicated later on, it is not always advisable to avail ourselves too much of a means of weeding out the upper harmonics by using very large self-induction. The best method of tuning depends on the nature of the problem before us."

**Harpoon, Electric** — —A harpoon containing a bomb, that is electrically fired or exploded by the harpooner after imbedding the harpoon.

**Heat, Electrical Equivalent of** — —A quantity representing the electrical energy produced by the action of a given amount or quantity of heat energy.

**Heater, Coil, Electric** — —An electric heater in which the heat is produced by the passage of an electric current through a coiled metallic ribbon.

A form of coil heater is shown in Fig. 573.

**Heater, Primary Electric** — —A term proposed for the main electric heater in a building. (See *Heater, Electric*.)

**Heeling Error of Mariner's Compass**.—(See Appendix—*Error, Heeling, of Mariner's Compass*.)

**Helix**.—A word sometimes used in electricity and magnetism in place of coil or solenoid. (See *Coil, Electric*.)

**Helix, Anomalous** — —A helix so wound as to produce an anomalous magnet. (See *Magnet, Anomalous*.)

**Helix, Left-Handed** — —A term sometimes employed in place of a left-handed

solenoid. (See *Solenoid, Left-Handed, Solenoid, Practical*.)

**Helix, Magnetic** — —A coil that is rendered magnetic by the passage through it of an electric current. (See *Coil, Electric*.)

**Helix, Magnetizing** — —A magnetizing coil. (See *Coil, Electric*.)

**Helix, Right-Handed** — —A term sometimes employed in place of right-handed solenoid. (See *Solenoid, Right-Handed, Solenoid, Practical*.)

**Helmholtz Galvanometer**.—(See Appendix—*Galvanometer, Helmholtz*.)

**Henry, International** — —The value of the international henry adopted by the Chicago Congress of 1893, as equal to the induction in a circuit when the electromotive force induced in this circuit is one international volt, while the inducing current varies at the rate of one ampère per second.

**Henry, Proposed A. I. E. E. Definition for** — —The name adopted by the Electrical Congress of 1893 for the practical unit of inductance.

A unit of inductance having the value of  $10^9$  absolute units, or nearly the length of an earth's quadrant.

This name was proposed by a Sub-Committee of the American Institute of Electrical Engineers on Provisional Programme of the International Electrical Congress, in Chicago, 1893, on the occasion of the World's Columbian Exposition.

This name was adopted by the said International Electrical Congress in August, 1893, with the following definition:

A henry is the induction in a circuit when the electromotive force induced in this circuit is one international volt, while the inducing current varies at the rate of one international ampère per second.

**Heptad Atom**.—(See Appendix—*Atom, Heptad*.)

**Hertz's Axial Oscillator**.—(See Appendix—*Oscillator, Hertz's Axial*.)

**Hertz's Linear Oscillator**.—(See Appendix—*Oscillator, Hertz's Linear*.)

**Hertz's Oscillator**.—(See Appendix—*Oscillator, Hertz's*.)



Fig. 573. Coil Heater.



**Hertzian Waves.**—(See Appendix—*Waves, Hertzian.*)

**Heterostatic Electrometer.**—(See Appendix—*Electrometer, Heterostatic.*)

**Hexad Atom.**—(See Appendix—*Atom, Hexad.*)

**High-Frequency Transformer.**—(See Appendix—*Transformer, High-Frequency.*)

**High-voltage Electro-Magnetic Generator.**—(See Appendix—*Generator, High-Voltage Electro-Magnetic.*)

**Home Battery.**—(See Appendix—*Battery, Home.*)

**Hook, Dipping** — —A metallic hook provided for holding articles that are to be cleansed, in order to prepare them for electroplating by subjecting them to the dipping process. (See *Dipping.*)

The dipping hook should be made of metal as nearly resembling the article to be plated as possible, so as thereby to prevent voltaic action taking place between the two metals with a consequent marking at the points of contact.

**Horizontal Intensity of Earth's Magnetism.**—(See Appendix—*Magnetism, Horizontal Intensity of Earth's.*)

**Horology, Electric** — —That branch of electric science which treats of the applications of electricity to the regulation or operation of clocks. (See *Clock, Electric.*)

**Hummer.**—A word sometimes employed in place of buzzer. (See *Buzzer, Electric.*)

**Hummer, Electric** — —A term sometimes used for electric buzzer.

**Hunting of Parallel Alternators.**—(See Appendix—*Alternators, Parallel, Hunting of.*)

**Hysteresis, Dielectric** — —A term proposed by Steinmetz for a variety of molecular friction, analogous to magnetic hysteresis, produced in a dielectric under changes of electrostatic stress.

The losses caused by dielectric hysteresis are probably proportional to the frequency and to the square of the E. M. F., i. e., to the electrostatic field intensity.

Losses ascribed to defective insulation are often, in the opinion of Steinmetz, caused, at least in part, by dielectric hysteresis.

**Hysteresis, Magnetic** — —A variety of molecular friction produced in the molecules of a magnetizable substance during changes of magnetic stress.

According to Steinmetz, the loss occasioned by magnetic hysteresis is proportional to the frequency and to the 1.6th power of the magnetic variation.

According to Steinmetz, for a magnetic cycle performed between the limits of magnetic induction  $B_1$  and  $B_2$ , the loss in ergs per cubic cm. is

$$L = n \left( \frac{B_1 - B_2}{2} \right)^{1.6}$$

where  $n$ , the coefficient of hysteresis, averages .0033 in average good sheet iron, .013 in cast iron, .003 to .03 in cast steel, and reaches as high as .08 in hardened steel.

With alternating magnetism the formula can be written

$$L = n B^{1.6}$$

The actual existence of magnetic hysteresis is denied by some able electricians.

## I

**I.**—A symbol proposed for intensity of current.

The defining equation is  $I = \frac{E}{R}$

**Θ** — —A symbol used in France and Germany for intensity of magnetization.

The defining equation is  $\Theta = \frac{M}{V}$

**Idiostatic Electrometer.**—(See Appendix—*Electrometer, Idiostatic.*)

**Idle Wire of Armature.**—(See Appendix—*Wire, Idle, of Armature.*)

**Idle Wire of Armature of Motor.**—(See *Wire, Idle, of Armature of Motor.*)

**Idle Wire of Dynamo.**—(See Appendix—*Wire, Idle, of Armature of Dynamo.*)



**Idle Wire of Motor.**—(See Appendix—*Wire, Idle, of Armature of Motor.*)

**Illumination, Cosine Law of** — — The intensity of the illumination emitted from or received by any element of surface is proportional to the cosine of the angle between its normal, and the direction of the radiation.

**Illumination, Glow** — — A term proposed for an illumination similar to that of the glow-worm; that is, illumination without sensible heat.

All artificial sources of light, such, for example, as a coal-oil lamp, a gas jet, an incandescent electric lamp, or an arc lamp, contain a much greater percentage of non-luminous than of luminous radiation, that is, of heat than light, being at the most a few per cent. of light, and considerably over 95 per cent. of heat.

The most economical artificial lighting is, of course, impossible under these circumstances.

In the light emitted by a firefly or a glow worm, practically all the radiation consists of light or radiation within the limits of visibility.

The term glow illumination has been proposed for illumination by light such as is furnished by a firefly or glow-worm; viz., for the light emitted by any source which is capable of producing luminous radiation only. In some forms of Tesla lamps the illumination closely approaches glow illumination.

**Immediate False Zero.**—(See Appendix—*Zero, Immediate False.*)

**Incandescent Bombardment Lamp.**—(See Appendix—*Lamp, Incandescent Bombardment.*)

**Incandescent Filament.**—(See Appendix—*Filament, Incandescent.*)

**Incandescent Lamp Cord.**—(See Appendix—*Cord, Incandescent Lamp.*)

**Incandescent Lighting Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Incandescent Lighting.*)

**Incandescing Filament.**—(See Appendix—*Filament, Incandescing.*)

**Inclination Magnetometer.**—(See Appendix—*Magnetometer, Inclination.*)

**Indicator, Disc, Mechanical Replacement of** — — Such a replacement or resetting of

a disc, arm, shutter or semaphore of an indicator as must be done by hand.

A non-automatic replacement of an indicator disc.

**Indicator, Fall-Back** — — A term sometimes employed in place of drop indicator.

**Indicator, Light, of Railroad Signal** — — A device by means of which an indication is given as to whether a signal lamp is lighted or not.

The light indicator is operated by means of a metallic bar, which increases in length by means of the heat of the lamp when lighted.

**Indicator, Polarized** — — A term sometimes employed for an indicator provided with a polarized armature.

**Indicator, Pole** — — An apparatus employed for readily determining whether the poles of a dynamo battery or other source are positive or negative.

A convenient form of pole indicator consists of a small electrolytic cell filled with a solution of a metallic salt. On the passage of the current through the electrolyte the character of the poles is readily determined by the change in color of the liquid adjacent to one pole of the indicator.

There are other well-known forms of pole indicators.

**Indicator, Tele** — — A term sometimes employed in place of telemeter. (See *Telemeter.*)

**Indicator, Telephone** — — An indicator employed on a telephone circuit to indicate the number of the correspondent calling. (See *Indicator, Electric.*)

A telephone indicator, as generally constructed, consists of some form of mechanical drop operated by the attraction of the armature of an electro-magnet which, permitting the fall of a drop or shutter, exposes the particular number of the correspondent calling.

**Indicator, Tri-Polar** — — An electromagnetic indicator, with three poles.

A straight bar magnet is employed, one end of which forms one pole and the other end is connected with a U-shaped piece of soft iron, so as to bring the two free ends of the latter up to the

line on the other pole. There are thus produced three poles; hence, the name, tri-polar.

**Indifferent Point.**—(See Appendix—*Point, Indifferent.*)

**Individual Signal.**—(See Appendix—*Signal, Individual.*)

**Individual Signalling Apparatus.**—(See Appendix—*Apparatus, Individual Signalling.*)

**Induced Electric Surging.**—(See Appendix—*Surging, Induced Electric.*)

**Induced Single-Needle Dial.**—(See Appendix—*Dial, Induced Single-Needle.*)

**Inductance, Mutual, Proposed A. I. E. E. Definition for** — — The mutual inductance of one electric circuit upon another is the ratio of the total magnetic induction linked with the second, due to a uniform current in the first, to the strength of that current.

The mutual inductance between two electric circuits is reciprocally equal when the environmenting medium has constant inductivity.

The C. G. S. unit of mutual inductance is one centimetre; the practical unit of self-inductance is one henry.

The following modification of the definition would appear to be preferable, viz.: the mutual inductance of one circuit on another is the ratio of the sum of the linkages of lines of magnetic induction with the second, due to a uniform current in the first, to the strength of that current.

**Inductance, Non-Ferric** — — A term proposed to distinguish an inductance in which no iron or magnetic metal enters.

A coil of copper forms a non-ferric inductance; the insertion of an iron core into the coil makes it become a ferric inductance.

**Inductance, Self, Proposed A. I. E. E. Definition for** — — The ratio of the total magnetic induction, linked with and established by an electric current, to the uniform strength of the same.

The inductance of a conducting circuit is constant when its environmenting medium has constant inductivity. A modification has been proposed for this definition similar to that proposed for mutual inductance.

**Inductance, Specific** — — A term proposed for the comparative value of inductance. (See *Inductance.*)

**Inductance Speed.**—(See Appendix—*Speed, Inductance.*)

**Inducteous Body.**—(See Appendix—*Body, Inducteous.*)

**Induction, Auto** — — A term sometimes employed instead of self-induction. (See *Induction, Self.*)

**Induction, Backward, of Dynamo Armature** — — The component of the armature magnetization opposing the magnetization of the field magnets. (See Appendix—*Induction, Cross, of Dynamo Armature.*)

Were there no forward lead given to the brushes, there would be no back induction; there would, however, be cross induction.

**Induction, Cross, of Dynamo Armature** — — A term sometimes employed in place of the induction produced in the armature of a dynamo-electric machine from the ampère turns acting across the main magnetic circuit, *i. e.*, those due to the current in the armature, and is the lead of the brushes tending to produce magnetic poles crosswise to the regular poles of the machine.

**Induction, Magneto-Electric** — — A term formerly employed for magneto-electric induction. (See *Induction, Magneto-Electric.*)

**Induction, Magnetic, Terrestrial** — — The production of magnetism by the action of the earth's magnetic field.

**Induction Motor.**—(See Appendix—*Motor, Induction.*)

**Induction Telegraph.**—(See Appendix—*Telegraph, Induction.*)

**Inductivity.**—A word proposed for specific inductance. (See Appendix—*Inductance, Specific.*)

**Inductivity, Proposed A. I. E. E. for** — — The inductivity at any point in an isotropic medium is the ratio added to unity of  $4\pi$  times the intensity of the magnetization there existing to the magnetizing flux density.

The ratio of the flux density to the magnetizing force.

The conventional symbol is  $\mu$  and it is synonymous with permeability.

**Inductive Body.**—(See Appendix—*Body, Inductive.*)

**Influence, Electrostatic** — —A word sometimes employed in place of electrostatic induction. (See *Induction, Electrostatic.*)

There would appear to be no real necessity for the abandonment of the term induction for the effects produced by an electrostatic field. The general similarity of the phenomena would, indeed, appear to render it advisable to retain the word electrostatic induction, to show its close relation to electro-magnetic induction.

**In-Put.**—The energy absorbed by a machine in driving it or causing it to perform a certain amount of work.

This word is used in contradistinction to output.

**Inside Box Brush.**—(See Appendix—*Brush, Inside Box.*)

**Instrument, S. N., Telegraphic** — —A contraction employed for single-needle telegraphic instrument.

**Insulated or Free** — —A term employed in telegraphy.

A wire is said to be free insulated when it is disconnected from its apparatus and left insulated.

**Insulation, Kilometric, of Cable** — —The insulation of a cable measured in kilometre-megohms or the average insulation of one kilometre in megohms.

**Insulation Lightning Protection.**—(See Appendix—*Protection, Insulation Lightning.*)

**Insulation Lightning Protector.**—(See Appendix—*Protector, Insulation Lightning.*)

**Insulator, Glass-Screw** — —A glass insulator provided with a screw thread inside the glass for the purpose of ready attachment to the insulator pin.

**Insulator, Shackle** — —A term sometimes employed for any form of shackle in-

ulator. (See *Insulator, Single-Shackle, Insulator, Double-Shackle.*)

**Insulator, Tree** — —A variety of insulator suitable for attachment to trees, and designed so as to keep the conductor from being brought into contact with the branches.

The insulator proper is mounted on a shaft which plays in a ball and socket joint, the cup of which is fastened to the tree; the line is therefore kept in its normal position despite the movements of the tree.

**In-Take.**—A word sometimes used in place of In-Put.

**Intensity of Radiation.**—(See Appendix—*Radiation, Intensity of.*)

**Interference, Acoustic** — —Interference of sound waves.

The term acoustic interference is employed in contradistinction to luminous interference.

**Interference, Electro-Magnetic** — —A term sometimes employed for the interference of electro-magnetic waves.

The term electro-magnetic interference is employed in contradistinction to acoustic or luminous interference, even though it be granted that luminous waves are electro-magnetic waves.

**Interference, Luminous** — —A term sometimes employed for the interference of light waves.

The term luminous interference is used in contradistinction to acoustic or electric interference.

**Internal Magnetic Circuit.**—(See Appendix—*Circuit, Magnetic, Internal.*)

**Internal Magnetic Field.**—(See Appendix—*Field, Magnetic, Internal.*)

**International Ampère.**—(See Appendix—*Ampère, International.*)

**International Coulomb.**—(See Appendix—*Coulomb, International.*)

**International Farad.**—(See Appendix—*Farad, International.*)

**International Henry.**—(See Appendix—*Henry, International.*)

**International Joule.**—(See Appendix—*Joule, International.*)

**International Morse Code.**—(See Appendix—*Code, International Morse.*)

**International Ohm.**—(See Appendix—*Ohm, International.*)

**International Volt.**—(See Appendix—*Volt, International.*)

**International Watt.**—(See Appendix—*Watt, International.*)

**Interrupter, Electro-Dynamic** — — A name proposed by Pupin for an interrupter for the primary circuit of an induction coil consisting of an elastic wire stretched like the wire of a sonometer or monochord between the poles of a permanent horseshoe magnet.

The term sonometer interrupter might, perhaps, be more descriptive of the apparatus employed.

The circuit connections are such that when the wire is set into vibration these vibrations are continued under the action of the field produced by the magnet. The construction and operation of an electro dynamic interrupter are given by its inventor, Pupin, as follows:

"In the meantime experience suggested the form given in Fig. 574 as best suited to the purpose for which the interrupter was first designed. The diagram of Fig. 575 explains the



Fig. 574.



Fig. 575.

construction of the apparatus more clearly. A sheet aluminium, or phosphor-bronze wire, the vibrator, is stretched between the pole pieces *d* and *e*, of two permanent Weston magnets, such as this distinguished electrician uses in his voltmeters.

Fig. 576 gives the front view of one of the magnets. The cross-section of the vibrator is seen there between the pole pieces *N*, *S*, as a black dot. The short line *a b* extending from the vibrator to the mercury cup below is the dipper, a short, thin, amalgamated copper wire, which is soldered to the vibrator. The vibrator rests on

two hard rubber bridges *f g*. One of its ends is rigidly attached to the wooden frame of the apparatus, the other end is attached to a lever *h*, which, worked by a micrometer screw, varies the tension of the vibrator.

There are three mercury cups, *a*, *b*, *c*, and three dippers (which unfortunately do not appear in Fig. 574). The middle cup *b*, is fixed in position, and the middle dipper, being at the nodal point of the vibrator, makes a permanent contact

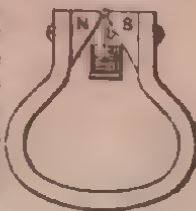


Fig. 576.

there. The other two dippers make contact with mercury cups which can be raised or lowered by means of a nut and screw as represented in Fig. 574, and indicated in diagram 575. The construction of the adjustable mercury cups and the stretching lever were copied from Dr. Max Wien's magnetic interrupter (*Wiedem. Ann.* 1891 and 1892). The middle cup (see Fig. 577) is connected to one pole, *F*, of the gravity or storage cell, the other two cups are connected one to one end and the other to the other end of the primary of the

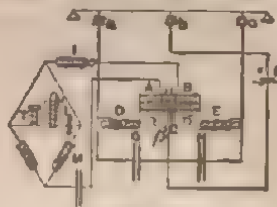


Fig. 577.

small coil *A B*. From the middle point, *C*, of the primary a wire leads to the other pole of the cell. Auxiliary small coils, *E* and *D*, and condensers, *H* and *G*, are inserted in the circuits as indicated. Their functions will be explained further below.

"The vibrator vibrates with a node at the middle dipper as soon as the tension has reached a certain, by no means high, limit. A permanent contact is therefore maintained at this point, and the contact is made at one of the cups just at about the same moment as it is broken at the other cup. Leaving the condensers out of consideration for the present, it is evident that this form of the current make-and-break produces the same effect upon the iron core of the coil as an alternating current would. The advantage of this needs no comment; but although the iron core consists of the finest iron wire that can be obtained in the market, yet it must be remem-



bered that the vibrator is expected to work sometimes at the rate of 512, or more, complete periods per second. Another immediate advantage which this interrupter offers is a considerable diminution of sparking. The addition of condensers, besides performing other functions which will be discussed presently, reduces the break sparks almost to invisibility, even when currents as large as half of an ampère are used. Each half of the primary coil consists of 532 turns of No. 22 silk-covered wire wound over an iron core of 30 centimetres in length, 4 square centimetres in cross-section, and consisting of very fine, soft iron wire."

**Interrupter, Sonometer** — — A term sometimes employed in place of electrodynamic interrupter. (See Appendix—*Interrupter, Electro-Dynamic*.)

**Interrupter, Telegraphic** — — A device for making and breaking a circuit at a definite rate.

A telegraphic key or other analogous device.

**Interrupter, Telegraphic, Mechanical** — — A form of mechanical telegraphic sounder for learners in which no battery is required.

A mechanical telegraphic interrupter is provided with a full-size key with a full set of adjustments. In fact, it resembles an ordinary key, except in that it requires no battery to operate it. It differs, therefore, from the snapper sounder, which is not intended to resemble a sounder, but merely to give the sounds of the Morse characters with the simplest mechanism.

**Interruption, Telegraphic** — — A term sometimes employed in telegraphy for faults in general.

According to Pope, telegraphic faults or interruptions arise from the following causes, viz.:

- (1.) Disconnections or breaks.
- (2.) Partial disconnections or resistance.
- (3.) Escapes.
- (4.) Crosses.

**Ions, Migration of** — — A term employed to express the movement of the ions in an electrolyte during electrolysis.

The hypothesis of Gröthuss attempts to explain the fact that in electrolysis the anions and kathions do not appear in any part of the electrolyte ex-

cept at the electrodes, no ions apparently being set free in the liquid. (See *Hypothesis, Gröthuss*.)

When copper electrodes are employed in the electrolysis of a solution of copper sulphate, the solution becomes from two to three times weaker at the kathode than at the other electrode. Hittorf explains this fact on the assumption that during the migration the  $\text{SO}_4$  radical moves through the liquid more rapidly than the Cu radical.

Gröthuss' hypothesis has been objected to because it requires a finite force to bring about the decomposition of the electrolyte, and the experiments of Helmholtz prove that the interior of an electrolyte is unable to withstand the slightest electrostatic stress. Clausius has modified Gröthuss' hypothesis so as to bring it more into accord with the kinetic theory of matter. He believes that some of the moving molecules of the electrolyte are broken up into their constituent ions as a result of occasional molecular impact, and that it is these separated ions only that appear at the electrodes. Arrhenius asserts that during electrolysis the greater part of the molecules of the electrolyte are thus dissociated. The velocity of the dissociated ions is assumed to be proportioned to the potential gradient in the electrolyte. According to this theory a continuous movement of positively charged ions occurs towards the negative electrode or kathode and of negatively charged ions towards the positive electrode or anode.

**Iron, Building** — — A heated iron tool, by means of which the mould impressed by the printed page, it is desired to electrotype, is built up preparatory to being placed in the electroplating bath.

A building iron consists essentially of a suitably shaped iron tool which is employed while hot in connection with strips of wax for bringing up or raising the blank spaces in a mould between the pages and paragraphs.

**Iron-Loss in Transformer.**—(See Appendix—*Transformer, Iron-Loss in*.)

**Isonisation.**—A term proposed for a decrease in the strength with which the separate atoms or radicals are held together in the molecules of an electrolyte.

A term proposed for that modified dissociation of a molecule which consists in a



weakening of the force which holds the ions of the molecules together in an electrolyte.

The term *ionisation* does not, as might be supposed, refer to the complete separation of an electrolyte into its ions by electrolysis, but to a preparatory weakening of the bonds which hold the ions together in a solution in which electrolysis is about to occur.

This term was proposed by Fitzgerald for the purpose of covering the peculiar action of electrolysis so far as its behavior to aqueous solutions of metallic salts is concerned.

**Isotropic.**—Homogeneous with respect to direction.

Employed in reference to the properties of a medium.

## J

**Jack Switch.**—(See Appendix—*Switch, Jack*.)

**Jar, Leyden, Overflow of** — —A term sometimes employed for the discharge of a Leyden jar by a disruptive discharge around its edge.

**Joint, End-to-End** — —A term frequently employed in place of butt joint. (See *Joint, Butt*.)

**Joint, Sliding** — —An expansion joint. (See *Joint, Expansion*.)

**Joule, International** — —The value of the international joule adopted by the Chicago Congress of 1893, as equal to  $10^7$  units of work in the C. G. S. system, and which is

represented sufficiently well for practical use by the energy expended in one second by one international ampère in an international ohm.

**Joule-Meter.**—Any apparatus capable of measuring energy in joules.

An energy meter as distinguished from a watt-meter.

**Jumper.**—A temporary shunt or circuit put around a lamp or loop on a series circuit, to enable it to be readily removed or repaired.

A jumper usually consists of a piece of wire of sufficient size to carry the current past the faulty lamp or other device which it is desired to temporarily remove or repair.

## K

**K.**—A symbol for moment of inertia.

The defining equation is  $M \times L^2$ .

**K (Kappa).**—A symbol proposed for magnetic susceptibility.

The defining equation is  $K = \frac{\mathcal{J}}{\mathcal{H}} i. e. \frac{1}{H}$

**kg.**—An abbreviation for kilogramme, the practical unit of mass.

**kg: cm<sup>2</sup>.**—An abbreviation proposed for kilogramme per square centimetre, the practical unit of pressure.

**kgm.**—An abbreviation for kilogrammetre, the practical unit of moment of a couple or of work.

**kgm: s.**—An abbreviation proposed for kilogrammetre per second, the practical unit of power.

**KR.**—A contraction for the total capacity of a telephone wire or conductor multiplied by its total resistance.

**KR Law.**—(See Appendix—*Law, The KR*.)

**Kapp Line.**—(See Appendix—*Line, Kapp*.)

**Karsten's Figures.**—(See Appendix—*Figures, Karsten's*.)

**Kathodic Rays of Vacuum Tube.**—(See Appendix—*Rays, Kathodic, of Vacuum Tube*.)

**Kerite Tape.**—(See Appendix—*Tape, Kerite*.)

**Key, Break** — —A key which breaks or opens the circuit when depressed.

**Key, Strap** — — A telegraphic key formed of a single plate of elastic material.

The elastic strip of conducting material is fixed at one end. Its motion in one direction is effected by the hand of the operator, and its return in the opposite direction by the elasticity of the material.

**Key, Successive Contact** — — A key so arranged as to make or break one contact after another.

A successive contact key is frequently used in connection with a Wheatstone bridge; where it is desirable to make or close the battery circuit before making or closing the galvanometer circuit, or to break the battery circuit after breaking or opening the galvanometer circuit. This is done by means of a successive contact key. A successive contact key is also sometimes called a double contact key. (See *Key, Double-Contact Form of Bridge, Sprague's. Key, Double-Contact, Lambert's.*)

**Key, Tapper** — — A term sometimes employed in place of Morse tapper. (See Appendix—*Tapper, Morse.*)

**Kick of Relay.**—A momentary effect, more powerful than usual, produced on the armature of a relay by the current of charge on the closing of the circuit.

The kick varies in its amount or intensity not only with the electrostatic capacity of the line, but also with its length and with the perfection of its insulation.

**Kilerg.**—A kilo-erg.

**Kilo-Erg.**—One thousand ergs.

**Kilo-Volt.**—One thousand volts.

**Kilometric Capacity of Cable.**—(See Appendix—*Capacity, Kilometric, of Cable.*)

**Kilometric Insulation of Cable.**—(See Appendix—*Insulation, Kilometric, of Cable.*)

**Kinematics.**—That branch of mechanics which treats of motions, irrespective of the mass moved or the forces which produce or oppose its motion.

**Kinetics.**—That branch of dynamics which treats of the action of forces in producing or modifying motion.

**Krizik's Cores.**—(See Appendix—*Cores, Krizik's.*)

## L

$L_m$ .—A symbol proposed for co-efficient of mutual induction.

$L_s$ .—A symbol proposed for co-efficient of self-induction or inductance.

The defining equation is  $L_s = \frac{\Phi}{I}$

**Lag, Translation** — — A term proposed by Elihu Thomson, who defines it as follows: "Lag due to the traverse of a conductor conveying current past a magnet pole, whereby the action of the current in that conductor becomes displaced in the direction of the motion and produces a moving field, the iron mass or body tending to accommodate itself to the direction of the lines of force in the moving field."

The phenomena of a shifting field are observed when a coil with an iron wire core is energized by an alternating current so as to produce an

alternating field, and a wheel made up of iron discs around which is a rim or band of copper overhanging the edges of the disc is placed in such field. On the energizing of the coil, the wheel, which is mounted on pivots, when mechanically started in rotation in either direction, will increase both in speed and torque to a degree depending on the frequency of the current, the friction to be overcome on the alternating field and on the iron and copper of the wheel. (See *Field, Magnetic, Shifting.*)

**Lamp, Arc, Striking Mechanism of** — — The mechanism in an arc lamp by means of which the carbons are separated to the distance at which it is desired the arc shall be maintained between them.

**Lamp, Bombardment, Electrical** — — A lamp in which the light is produced in a vacuous space by means of the bombard-

ment of the molecules of the residual gas by the passage of electrical discharges.

The molecules in their rapid to-and-fro motions are caused to strike against, and thus raise to incandescence, strips or bars of refractory material, such as carbon, etc.

Tesla's straight filament incandescent electric lamp is a form of electric bombardment lamp. (See *Lamp, Incandescent, Straight-Filament*.)

#### **Lamp, Burned-Out Incandescent — —**

A term sometimes employed for an electric incandescent lamp which is no longer able to furnish efficient electric light.

An incandescent electric lamp is, strictly speaking, to be regarded as burned out when it no longer furnishes a suitable light, and this, whether the filament or chamber has been actually destroyed or not.

#### **Lamp, Electric, Efficiency of — —**

Strictly, the ratio of the luminous energy emitted by the lamp, to the energy absorbed by the lamp.

The term efficiency of a lamp is less accurately used to signify its relative watts per candle power. The Edison lamps are of high efficiency if 3.1 watts per c. p., and of low efficiency if greater.

#### **Lamp, Electric Stopper — —**

A term now generally employed for an incandescent electric lamp in which the chamber is stopped, not as formerly by the fusion of the glass, but by the action of a glass stopper hermetically sealed by the use of suitable cement.

Fig. 578 shows a lamp of this type.

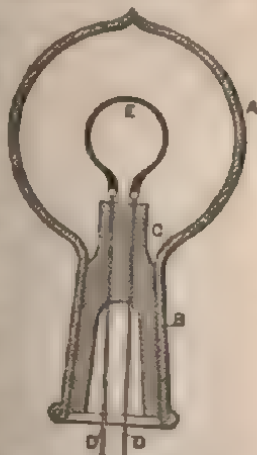


Fig. 578. Electric Stopper Lamp.

#### **Lamp, Glow — —**

A lamp the light of which is produced by glow illumination. (See Appendix—*Illumination, Glow*.)

The term glow lamp is already generally employed in England and Germany for the ordinary incandescent electric lamp. It would appear that the term incandescent lamp generally employed in America is preferable. The term glow-lamp should be limited, as above, to a lamp producing an approximately cold light; namely, a lamp operating by glow illumination.

#### **Lamp, Incandescent Bombardment — —**

—An electric lamp in which a refractory material is rendered incandescent by the molecular bombardment produced by the passage of an electric discharge through a rarefied space.

Most of Tesla's lamps are of the bombardment type and are of a great variety of forms, but in all of them refractory substances like carbon are rendered incandescent by the passage of very rapidly alternating currents through rarefied gases. (See *Lamp, Electric, Incandescent Ball*, *Lamp, Incandescent, Straight Filament*.)

#### **Lamp, Incandescent Electric, Ageing of — —**

—A term sometimes employed for a gradual decrease in the economical light emitted by an incandescent electric lamp attending its continued use.

#### **Lamp, Phosphorescent — —**

A lamp whose light is obtained by means of the phosphorescent effects attending the discharges of electricity through a rarefied space.

In phosphorescent lamps the phosphorescent effects are produced by causing the molecules of the residual gas to strike against some readily phosphorescent material. Such lamps are sometimes called bombardment lamps. But the term bombardment lamp is [perhaps more properly] restricted to cases where molecular bombardment raises a substance of high refractory power, such as carbon, to incandescence; while the term phosphorescent lamps is limited to cases where the material so raised to luminescence is a phosphorescent material. (See *Bombardment, Molecular*.)

#### **Law, The KR. — —**

A generalization claimed by some as a law, but denied by most, which assigns a limit to the distance through which intelligible telephonic communication can be carried on to cases where the product of K, the capacity of the tele-

phone circuit, multiplied by  $R$ , its resistance, does not exceed a certain value.

Preece originally fixed the limits of intelligible communication of speech by means of a telephone to cases where the product of  $K$  and  $R$  did not exceed 15,000. Preece's figures do not agree with the results of practical telephone work in the United States; such, for example, as in the case of the line now in actual operation between Boston and Chicago.

Preece's general method of calculating the  $K$   $R$  of a metallic circuit was by multiplying the total capacity of the line by its total resistance and then dividing by four, since the capacity of an insulated loop is taken as one-fourth of the capacity of the entire length of the line measured against the ground. Even when calculated in this way the  $K$   $R$  of the Boston-Chicago conductor line is nearly 54,000.

**Lead Sulphate of Copper Cell.**—(See Appendix—*Cell, Lead Sulphate of Copper.*)

**Lead Sulphate of Zinc Cell.**—(See Appendix—*Cell, Lead Sulphate of Zinc.*)

**Leads, Double-Wire System for Electric Light** — —A term employed for a parallel or multiple system of leads for electric light. (See *Circuit, Parallel. Circuit, Multiple.*)

**Leads, Grouping System for Electric Light** — —A term sometimes employed for series-multiple circuits. (See *Circuit, Series-Multiple.*)

**Leads, Single Wire System for Electric Light** — —A term sometimes employed for a circuit in which the current after passing through the lamps is returned by means of the earth or ground.

This is called the single wire system for electric light leads because but a single wire or conductor is employed in the circuit, the return being made through the ground or earth.

**Leak, Telegraphic, Resistance of** — — The resistance offered by a leak in a telegraphic line or circuit.

**Leakance.**—A word proposed by Heaviside for leakage conductance.

It will be seen that the proposed word is an abbreviation or contraction for leakage-conductance.

**Lease, Way** — —A permit obtained from the owner of a property for the erection of poles or other attachments for telephonic or telegraphic lines.

**Left-Hand Trolley Switch.**—(See Appendix—*Switch, Left-Hand Trolley.*)

**Left-Handed Helix.**—(See Appendix—*Helix, Left-Handed.*)

**Left-Handed Rotation.**—(See Appendix—*Rotation, Left-Handed.*)

**Left-Handed Spiral.**—(See Appendix—*Spiral, Left-Handed.*)

**Lever Switch.**—(See Appendix—*Switch, Lever.*)

**Light, Castor and Pollux** — —A term formerly used in place of St. Elmo's fire.

**Light Cell.**—(See Appendix—*Cell, Light.*)

**Light Indicator of Railroad Signal.**—(See Appendix—*Indicator, Light, of Railroad Signal.*)

**Light Load.** — (See Appendix—*Load, Light.*)

**Light, Northern** — —An aurora borealis.

**Lighting, Vacuum-Tube** — —Artificial illumination obtained by the passage of electric discharges through vacuum tubes.

A practical system of electric lighting by means of vacuum tubes was not long ago regarded as an impossibility; now, however, through the labors of many distinguished men, especially those of Tesla, such a system, which seems to possess many advantages, bids fair in event of certain difficulties being overcome to become a formidable rival to the incandescent electric lighting.

In a system of vacuum-tube lighting, some source of high alternating potential furnishing from 50,000 to 100,000 volts or more is employed. Such discharges are most readily obtained by means of an alternator and disruptive discharges from condensers in connection with an oil transformer. The oil transformer is employed on account of the high resistance of the oil as a dielectric. One of the most important advantages which vacuum-tube lighting possesses over lighting by means of the ordinary incandescent electric lamp is that it produces a cold light or illumination of the type of glow illumination. (See Appendix—*Illumination, Glow.*)

**Lightning Arrester Board.**—(See Appendix—*Board, Lightning Arrester.*)

**Lightning, Bead** — — — A form of lightning discharge in which the flash produces a discontinuous line of light, thus causing the discharge to assume a bead-like appearance.

**Lightning Tube.**—(See Appendix—*Tube, Lightning.*)

**Limit, Magnetic** — — — A term sometimes employed for the temperature at which a magnetic substance loses its magnetism on exposure to heat.

**Line, Kapp** — — — A term proposed, but not generally adopted, for the English unit of magnetic induction.

This term, which defines the lines per square inch instead of per square centimetre, does not harmonize with the C. G. S. system of units, and, therefore, should not be encouraged.

**Line, Telegraphic, Charge Current on** — — — The current produced by the initial rush of electricity into a telegraphic line on the closing of the circuit.

**Lines of Magnetization.**—(See Appendix—*Magnetisation, Lines of.*)

**Linear Capacity of Cable.**—(See Appendix—*Cable, Linear Capacity of.*)

**Linear Density of Charge.**—(See Appendix—*Charge, Linear Density of.*)

**Linear Insulation of Cable.**—(See Appendix—*Cable, Linear Insulation of.*)

**Liquid, Quickening** — — — A term sometimes applied to a quickening solution. (See *Solution, Quickening.*)

**Lithanode.**—A name employed for a solid highly conducting block of lead peroxide prepared by a certain process for the plate of a storage cell. (See *Cell, Storage.*)

The word lithanode is properly applied to the product produced by Fitzgerald's process.

**Lithotripsy, Electro** — — — A term pro-

posed for a crushing or removing of urinary calculi by means of electrolysis.

**Load.**—The work thrown upon an electromagnetic system or machine.

The load on a dynamo, for example, means the value of its activity or rate of doing work.

**Load Diagram.**—(See Appendix—*Diagram, Load.*)

**Load, Full** — — — A term indicating the condition of running with a comparatively large amount of work.

**Load, Light** — — — A term indicating the condition of running with a comparatively small amount of work.

**Locomotive, Telpher** — — — An electric motor by means of which telpher cars are drawn on a telpher line. (See *Telpherage.*)

**Long-Range Electrometer.**—(See Appendix—*Electrometer, Long-Range.*)

**Loop Test.**—(See Appendix—*Test, Loop.*)

**Loss,  $C^2 R$**  — — — A term for the loss of energy in a conductor due to the ohmic resistance offered by the conductor to its passage.

The product  $C^2 R$  = activity in watts. In this formula,  $C$ , is the current in amperes and  $R$ , is the ohmic resistance in ohms, and, when multiplied by the proper factor, it will give the value of the loss in heat units.

**Loss, Core, of Transformer** — — — A loss of energy in the core of a transformer due to hysteresis and Foucault or eddy currents, etc.

**Low-Frequency Transformer.**—(See Appendix—*Transformer, Low-Frequency.*)

**Low-Test Fault.**—(See Appendix—*Fault, Low-Test.*)

**Luminous Disc-Shaped Discharge.**—(See Appendix—*Discharge, Luminous Disc-Shaped.*)

**Luminous Interference.**—(See Appendix—*Interference, Luminous.*)



## M

$\mathcal{M}$ .—A symbol for magnetic moment.

The defining equation is  $\mathcal{M} = m l$ .

m.—An abbreviation for minute, one of the practical units of time.

$m$ .—A symbol for strength of magnetic pole.

The defining equation is  $F = \frac{m^2}{L^2}$

m.—An abbreviation for metre, the practical unit of length.

$\mu$ .—A symbol for magnetic permeability or inductivity.

The defining equation is  $\mu = \frac{36}{36}$

$m^2$ .—An abbreviation for square metre, the practical unit of surface.

$m^3$ .—An abbreviation for cubic metre, the practical unit of volume.

m. a.—A contraction for milli-ampère, (See *Milli-Ampère*.)

m: s.—An abbreviation proposed for metre-per-second, the practical unit of velocity.

m: s<sup>2</sup>.—An abbreviation proposed for metre-per-second-per-second, the practical unit of acceleration.

**M. Current.**—(See *Appendix—Current, M.*)

**M. P.**—A contraction proposed for man-power.

**M. S. Current.**—(See *Appendix—Current, M. S.*)

**Machine, Dynamo-Electric, Arc Lighting** — — A dynamo-electric machine suitable for supplying current to arc lamps.

Arc lights are almost invariably connected to the circuit in series. In such cases the series-wound dynamo is preferable for feeding such circuits. (See *Machine, Dynamo-Electric, Series-Wound*.)

**Machine, Dynamo-Electric, Compensating-Alternating** — — A term proposed

for a compensating alternator. (See *Appendix—Alternator, Compensated*.)

**Machine, Dynamo-Electric, Direct Current** — — A term sometimes employed in place of continuous current dynamo-electric machine. (See *Machine, Dynamo-Electric, Continuous Current*.)

**Machine, Dynamo-Electric, for Electro-Plating** — — A dynamo-electric machine suitable for use in electro-plating. (See *Machine, Dynamo-Electric, Plating, Electro*.)

An electro-plating dynamo-electric machine possesses many advantages over a voltaic battery for the ready production of the current required in electro-plating. By its use the tedious, expensive, and often unhealthy charging of a voltaic battery is entirely dispensed with, since the mere running of a belt over a pulley, and the proper speeding of the machine, is all that is required to furnish a suitable current.

Dynamo-electric machines for electro-plating should be furnished with a device for the purpose of preventing a reversal of the polarity of the dynamo by means of the current produced by the polarization of the electrodes or articles connected with the plating bath. The tendency of this current is of course opposed to that of the current furnished to the bath, and, should the machine be continued in use as a source of current for plating while its polarity is reversed, the metal already deposited on the articles that are being electro-plated will be removed.

In the early history of the art, considerable difficulty was experienced with series-wound machines due to reversals in the polarity of the dynamos, by means of the current sent backwards through the dynamo by the counter E. M. F. of the electro-plating bath, whenever, by reason of a decrease of current strength, or a decrease of the speed of the dynamo, its E. M. F. fell below the counter E. M. F. of the bath.

Weston prevents such a reversal of the polarity of the dynamo by opening the circuit of the machine as soon as the speed of the machine falls below a certain point. He does this by means of the centrifugal force acting on a small quantity of mercury in a small hollow conical-shaped vessel.

Brush first accomplished this same result by means of a shunt which he called a "teaser." His early plating machine containing this device was the prototype of the compound-wound dynamo-electric machine. In it the coils of the field magnets are excited partly by the main current and partly by a current shunting across the brushes of the machine. A machine so constructed possesses the great advantage of rendering the machine self-regulating under certain circumstances. This additional or shunt circuit takes a variety of forms. (See *Machine, Dynamo-Electric, Compound-Wound*.)

The difficulty of reversed polarity has disappeared since the introduction of the shunt or compound wound dynamo, i. e., a dynamo whose field is wholly or in part excited by a current shunted across the brushes of the armature. In such a machine, even if the E. M. F. falls below the counter E. M. F. of the bath, the current in the shunt field, and therefore the polarity, remains unchanged, and the current reverses only in the armature.

**Machine, Dynamo-Electric, Four-Pole** — —A term sometimes employed for a dynamo-electric machine in which the field is produced by two separate north poles, and two separate south poles.

**Machine, Dynamo-Electric, Incandescent Lighting** — —A term sometimes employed for a dynamo-electric machine suitable for furnishing the currents employed for incandescent electric lamps.

For all cases where the incandescent electric lamps are connected to the leads in multiple-arc, or any of its varieties, any machine capable of producing and maintaining a constant potential at its terminals, notwithstanding changes in the load on it, is suitable for use as an incandescent electric-lighting dynamo-electric machine. Compound-wound machines are generally employed for such purposes. (See *Machine, Dynamo-Electric, Compound-Wound*.)

**Machine, Dynamo-Electric, Separate-Coil Alternating** — —A term sometimes employed for a separate coil alternator. (See Appendix—*Alternator, Separate-Coil*.)

**Machine, Dynamo-Electric, Separately Excited Alternating** — —A term sometimes employed for separately excited alter-

nator. (See Appendix—*Alternator, Separately Excited*.)

**Machine, Dynamo-Electric, Six-Pole** — —A term sometimes employed for a dynamo-electric machine in which the field is produced by six poles, i. e., three separate north poles and three separate south poles.

**Machine, Dynamo-Electric, Two-Pole** — —A term sometimes employed for a dynamo-electric machine in which two poles only are employed for producing the field.

Such a machine is usually called a bi-polar machine.

**Machine, Magneto-Electric, Alternating** — —An alternating current dynamo-electric machine, the field of which is produced by permanent magnets.

A magneto alternator. (See Appendix—*Alternator, Magneto*.)

**Machine, Speeding of** — —Obtaining the requisite number of rotations of an armature of a machine per second.

Machines as ordinarily constructed produce their most economical output for practical purposes when a certain speed of rotation has been obtained.

**Machines, Dynamo-Electric, Alternating, Parallel Working of** — —The working of two or more alternators in parallel. (See Appendix—*Alternators, Parallel Connection of*.)

**Machines, Dynamo-Electric, Alternating, Series-Working** — —The series connection of two or more alternating dynamo-electric machines. (See Appendix—*Alternators, Series Connection of*.)

**Magazine, Magnetic** — —A term sometimes employed for a compound magnet. (See *Magnet, Compound*). (Obsolete.)

**Magne-Crystalline Force.** (See Appendix—*Force, Magne-Crystalline*.)

**Magne-Electric Induction.** — (See Appendix—*Induction, Magne-Electric*.)

**Magnet, Choke** — —A term proposed for choking coil. (See *Coil, Choking*.)

The term choking coil would appear to be preferable.

**Magnet, Compound** — — A term formerly applied to an induction coil with two separate circuits.

The use of this word is inadvisable. The same word is already correctly employed for a magnet formed of a number of separate magnets. (See *Magnet, Compound*.)

**Magnet, Deflecting** — — The permanent magnet of a magnetometer employed for deflecting a small magnetic needle suspended at a definite distance in order to compare its influence with that of the earth's horizontal magnetic force.

**Magnet, Differential, Electro** — — A differentially wound electro-magnet. (See Appendix—*Winding, Differential*.)

**Magnet, Electro-Compound** — — A term formerly applied to an electro-magnet the core of which is wound with two separate wires or conductors.

**Magnet, Laminated, Permanent** — — A term sometimes employed in place of compound magnet.

**Magnet, North Pole of, Proposed A. I. E. E. Definition for** — — The pole of a magnet which seeks the geographical north pole.

**Magnet, South Pole of, Proposed A. I. E. E. Definition for** — — The pole of a magnet which seeks the geographical south pole.

**Magnet, Theoretical** — — A hypothetical magnet assumed for the purpose of mathematical discussion, as fulfilling the following conditions, namely: An infinitely long and thin, uniformly magnetized bar.

**Magnet, Voltaic** — — A term sometimes employed for a solenoid or electro-magnetic helix. (See *Solenoid*.)

**Magnetic Alternator**.—(See Appendix—*Alternator, Magnetic*.)

**Magnetic Atmosphere**.—(See Appendix—*Atmosphere, Magnetic*.)

**Magnetic Bearing**.—(See Appendix—*Bearing, Magnetic*.)

**Magnetic Compensator**.—(See Appendix—*Compensator, Magnetic*.)

**Magnetic Disturbance**.—(See Appendix—*Disturbance, Magnetic*.)

**Magnetic Effluvia**.—(See Appendix—*Effluvia, Magnetic*.)

**Magnetic Fluid**.—(See Appendix—*Fluid, Magnetic*.)

**Magnetic Flux Path**.—(See Appendix—*Path, Magnetic Flux*.)

**Magnetic Helix**.—(See Appendix—*Helix, Magnetic*.)

**Magnetic Hysteresis**.—(See Appendix—*Hysteresis, Magnetic*.)

**Magnetic Limit**.—(See Appendix—*Limit, Magnetic*.)

**Magnetic Magazine**.—(See Appendix—*Magazine, Magnetic*.)

**Magnetic Phantom**.—(See Appendix—*Phantom, Magnetic*.)

**Magnetic Shading**.—(See Appendix—*Shading, Magnetic*.)

**Magnetic Source**.—(See Appendix—*Source, Magnetic*.)

**Magnetic Spectrum**.—(See Appendix—*Spectrum, Magnetic*.)

**Magnetic Spiral**.—(See Appendix—*Spiral, Magnetic*.)

**Magnetic Voltmeter**.—(See Appendix—*Voltmeter, Magnetic*.)

**Magnetism**.—That branch of science which treats of the laws and phenomena of magnetism.

The use of this term should not be encouraged.

**Magnetician**.—A word proposed for one skilled in the science of magnetism as known.

This word appears to be a good one, but is little used.

**Magnetine**.—A word formerly employed for the principle of magnetism, or for the imponderable, hypothetical fluid in which magnetic phenomena were assumed to take place.

**Magnetisation**.—(See *Magnetization*.)

**Magnetisation, Back** — — (See Appendix—*Magnetization, Back*.)

**Magnetisation, Lines of** — — (See Appendix—*Magnetization, Lines of*.)

**Magnetish.**—Possessing the property of magnetism to a limited degree.

This term is a bad one, and its use should be avoided.

**Magnetism, Complex-Lamellar, Distribution of** — —The distribution of the magnetism of a finite magnet into an infinite number of complex magnetic shells.

**Magnetism, Horizontal Intensity of Earth's** — —The force which causes a magnetic needle to come to rest in a horizontal position in the earth's field.

The horizontal intensity of the earth's magnetism can be determined by means of a magnetometer. The horizontal intensity at any place is proportional to the square root of the number of oscillations which a needle suspended about a vertical axis performs at that place in a given time, when disturbed from its position of rest in the earth's field.

**Magnetism, Total Intensity of Earth's** — —The entire force of the earth's magnetism.

The total intensity of the earth's magnetism is equal to the resultant of the horizontal and vertical intensities, or to the quotient of the horizontal intensity by the cosine of the angle of dip.

**Magnetism, Rmanent** — —A phrase sometimes used in place of residual magnetism. (See *Magnetism, Residual*.)

**Magnetism, Specific** — —A term proposed for the quotient of the magnetic moment of a magnet by its mass.

**Magnetism, Vertical Intensity of Earth's** — —The force which tends to cause a magnetic needle to assume a vertical position.

The following formula gives the vertical intensity of the earth's magnetism :

$$V = H. \tan. \theta$$

Where  $V$  = vertical intensity.

$H$  = the horizontal intensity.

and  $\theta$  = the angle of dip.

**Magnetist.**—A magnetician.

The word magnetician is preferable.

**Magnetizability.**—Possessing the ability of becoming magnetized.

**Magnetization, Back** — —A term proposed in place of back or backward induc-

tion. (See Appendix—*Induction, Backward*.)

**Magnetization, Circular** — —The magnetization which exists in a diphas motor in which two alternating magnetic fluxes of equal amplitude are produced in quadrature or at right angles to each other.

**Magnetization, Elliptical Rotary** — —The magnetization which exists in a diphas motor in which two alternating magnetic fluxes exist out of phase with each other.

**Magnetization, Lines of** — —A term sometimes employed for lines of magnetic induction.

When lines of magnetic force pass through air, the number of lines of induction are the same as the number of lines of magnetizing force ; when, however, the lines of force pass through iron, the number of such lines of induction is greatly increased.

**Magnetizee.**—A word proposed to designate a person who believes he is placed under the power of animal magnetism.

**Magnetizer.**—A word proposed to designate a person who claims to place another under the power of animal magnetism.

**Magnetizing Helix.**—(See Appendix—*Helix, Magnetizing*.)

**Magnetizing Spiral.**—(See Appendix—*Spiral, Magnetizing*.)

**Magneto-Alternator.**—(See *Alternator, Magneto*.)

**Magneto-Chemical Cell.**—(See Appendix—*Cell, Magneto-Chemical*.)

**Magnetod.**—A word employed by Reichenbach for the assumed force or principle of animal magnetism.

**Magneto-Electric Alternating Machine.**—(See Appendix—*Machine, Magneto-Electric Alternating*.)

**Magneto-Inductive Capacity.**—(See Appendix—*Capacity, Magneto-Inductive*.)

**Magnetology.**—That branch of science which treats of magnetism.

The word magnetism would appear to be preferable.



**Magnetometer, Inclination** — — A form of magnetometer suitable for measuring variations in the magnetic inclination at any place.

**Magnetometer, Registering Declination** — — A form of magnetometer in which the variations of the declination at any place can be automatically registered.

**Magnetometer, Variation** — — A form of magnetometer suitable for measuring changes in the magnetic variation at any place.

**Magneto-Metric.**—Of or pertaining to the measurement of magnetic force.

**Magnetometry.**—That branch of science which treats of the measurement of the strength of magnetic fields.

**Magneto-Motor.**—(See Appendix—*Motor, Magneto*.)

**Magnetophone.**—A word sometimes used for a magneto telephone.

**Magneto-Tapper.**—(See Appendix—*Tapper, Magneto*.)

**Man Power.**—(See Appendix—*Power, Man*.)

**Manual Repeater.**—(See Appendix—*Repeater, Manual*.)

**Manual Translation.**—(See Appendix—*Translation, Manual*.)

**Marks, Ripple, Electrical** — — Wave marks produced in a fine powder by the discharge of a Leyden jar in its neighborhood.

These ripple marks are due to waves set up in the air by the passage of the discharge.

The same discharge that produces waves in ether also sets up waves in the surrounding air. It can be shown that the same discharge that can excite ether waves 1 kilometre in length can excite waves in the air about 1 millimetre in length.

**Matt.**—A word employed in electro-plating to designate the appearance presented by an electro-plating of silver in which the deposit is interlaced and closely massed together. (See *Plating, Electro*.)

**Matter, Electric** — — A term formerly applied to the — which was believed to

constitute the effluvia formerly assumed to pass off from an electrified body.

**Matter, Fourth State or Condition of** — — A term sometimes employed for the ultra-gaseous or radiant state of matter. (See *Matter, Radiant or Ultra-Gaseous*.)

**Matting, Burglar Alarm** — — A matting provided with a number of invisible contacts connected with alarm bells whose circuits are closed by treading on the matting. (See *Matting, Invisible Electric Floor*.)

**Maximum Negative Elongation.**—(See Appendix—*Elongation, Maximum Negative*.)

**Maximum Positive Elongation.**—(See Appendix—*Elongation, Maximum Positive*.)

**Maximum Starting Current of Motor.**—(See Appendix—*Current, Maximum Starting, of Motor*.)

**Maynooth Voltaic Cell.**—(See Appendix—*Cell, Voltaic, Maynooth*.)

**Mechanical Replacement of Disc-Indicator.**—(See Appendix—*Indicator, Disc, Mechanical Replacement of*.)

**Mechanical Telegraphic Interrupter.**—(See Appendix—*Interrupter, Telegraphic, Mechanical*.)

**Medication, Cataphoric** — — The introduction of drugs or other medicaments into the body through its tissues by the cataphoric action of an electric current. (See *Cataphoresis, Osmosis, Electric*.)

**Medium, Anisotropic** — — A medium which manifests different actions in different directions; *s. e.*, an isotropic medium. (See *Medium, Isotropic*.)

Crystallized bodies are in general notably anisotropic, while amorphous substances are generally isotropic.

An anisotropic substance may be expected to possess different electrostatic elasticity and inductive capacity in different directions.

**Melting of Electric Conductor.**—(See Appendix—*Conductor, Electric, Melting of*.)

**Mercurial Phosphorus.**—(See Appendix—*Phosphorus, Mercurial*.)



**Metallic Conduction.**—(See Appendix—*Conduction, Metallic.*)

**Metallic Cross.**—(See Appendix—*Cross, Metallic.*)

**Metallo-Chromes.**—Colors which appear when a salt of lead, such as the acetate, is electrolyzed under peculiar circumstances.

Metallochromes are produced by electrolytic deposits of peroxide of lead in the neighborhood of the anode. When the thickness of the coating, which is deposited on a plate of polished steel, is properly regulated, a series of brilliant colors appear.

Cavendish recommends the following process for obtaining metallochromes.

"Place the polished steel plate in a glass basin containing a clear solution of acetate of lead, and over it a piece of card. A small rim of wood should be placed over the card, and on that a circular copper disc. On contact being made from 5 to 20 minutes, with two or three cells of a small constant battery, the steel plate being connected with the positive electrode, and the copper disc with the negative, the deposit will be effected, and a series of exquisite colors will appear on the steel plate. The colors are films of peroxide of lead thrown down on the surface of the steel, and the varied tints are occasioned by the varying thicknesses of the precipitated film, the light being reflected through them from the metallic surface below. By reflected light every prismatic color is seen; and by transmitted light a series of prismatic colors complementary to the first series appears, occupying the place of the latter series.

"The colors are seen in the greatest perfection by placing the plate before a window, and inclining a white sheet of paper at 45 degrees over it."

Similar colorations are obtained when other substances are electrolytically deposited. Under certain conditions these colorations assume the form of concentric circles, that are sometimes called Noth's rings.

Noth's rings are readily obtained by placing a drop of acetate of copper on a silver plate and touching the middle of the drop with a piece of zinc. Under these circumstances prismatically colored rings are formed, that are disposed concentrically around the point of contact of the zinc.

**Meteorograph, Electric.**—An apparatus for automatically registering various meteor-

ological values, such, for example, as the indications of a barometer or thermometer, the direction and velocity of the wind, or the value of the rainfall.

**Meteorology.**—That branch of physics which treats of the phenomena of the atmosphere.

**Meteorology, Electric** — — That branch of meteorology which treats of the electric phenomena of the atmosphere.

**Meter, Coulomb** — — Any form of apparatus capable of measuring the number of coulombs that pass in a circuit in a given time.

Any form of galvanometer which gives the current in amperes will give the number of coulombs that pass if the time the current is flowing is known. Various forms of electric meters will therefore give the number of coulombs that pass in a circuit. (See *Meter, Electric.*)

**Meter, Electrolytic** — — An electrochemical meter. (See *Meter, Electro-Chemical.*)

**Meter, Quantity** — — A coulomb meter.

**Meter, Telephonic** — — A meter employed for recording the time during which a telephone is in use.

The telephonic meter, as at present constructed, consists essentially of a clock, the pendulum of which is caught by means of a lever connected with the telephone lever. By such means the clock is stopped while the telephone is out of use or is hung on its hook.

**Method, Accumulation, for Testing Joints in Electric Cables** — — A sensitive method of testing the insulation of a joint, or of a few feet of gutta-percha core, by allowing the leakage of the joint to accumulate through a condenser for a considerable time and then measuring the condenser discharge.

**Method of Slow Discharge.**—(See Appendix—*Discharge, Slow, Method of.*)

**Mho, Proposed A. I. E. E. Definition for** — — A name proposed for the practical unit of conductivity.

A unit of electrical conductance of the value of  $10^{-9}$  absolute units; or, in other words, having a value equal to the reciprocal of the ohm.

This name for the practical unit of electrical conductance was proposed by a Sub-Committee of the American Institute of Electrical Engineers on Provisional Programme of the International Electrical Congress, held in Chicago, U. S. A., in 1893, on the occasion of the World's Columbian Exposition.

**Mhometer.**—An instrument for measuring the value of conductance in mhos. (See *Conductance*, *Mho*.)

**Micanite.**—A name sometimes given to a variety of insulating material made from pure mica bound together by some cementing material.

**Micro-Ohm.**—The millionth of an ohm.

**Microphone, Plastic-Circuit** — —A microphone in which the ordinary variable contact is replaced by a plastic material of low conducting power.

The plastic-circuit microphone is the invention of Clammond. In it the ordinary powder forming the loose contact is obtained by means of a plastic material composed of a mixture of a good conducting substance with some plastic non-conducting material.

The advantage claimed for the plastic-circuit telephone transmitter is that it has a much greater range of operation than the ordinary contact microphone, being able to transmit either faint or loud tones with equal distinctness.

**Migration of Ions.**—(See Appendix—*Ions*, *Migration of*.)

**Mile, Ohm** — —The number obtained by multiplying the weight of 1 mile of wire of a given substance by its resistance.

The ohm mile of a given substance is the mass of a mile of wire of that substance having the resistance of an ohm.

**Milli-Ammeter.**—A milli-ampère meter.

**Milli-Ampère Meter.**—(See *Meter*, *Milli-Ampère*.)

**Mining, Electric** — —Carrying on the various operations of mining by means of electric power.

Electricity has been successfully employed in mining for the driving of percussion or rotary drills, for electric haulage, for pumping, and for purposes of communication, ventilation, power and artificial lighting.

**Minus Charge.**—(See Appendix—*Charge*, *Minus*.)

**Molecular Decomposition.**—(See Appendix—*Decomposition*, *Molecular*.)

**Molecular Voltaic Couple.**—(See Appendix—*Couple*, *Molecular Voltaic*.)

**Monad Atom.**—(See Appendix—*Atom*, *Monad*.)

**Monochord.**—A single stretched wire for measuring the relative number of vibrations produced by different musical notes.

The instrument takes the name monochord, from the fact that it consists, practically, of a single chord stretched between two points of support over a resonant case, and provided with means for suitably adjusting its tension so as to produce, when vibrating as a whole, a note of a given musical pitch. When it is required to determine the relative number of vibrations existing between the note which the monochord produces and some other note, a sliding bridge is placed in some intermediate part of the wire so as to cut off a part of its length.

When the length of the original wire has been shortened by means of a sliding bridge, so that it produces a higher note whose pitch is to be compared with that of the wire vibrating as a whole, the relative number of vibrations are then inversely proportional to the lengths of the two wires.

**Mop, Polishing** — —A disc formed of circular pieces of calico, felt, or similar soft material mounted on a shaft and employed, when put in rapid rotation, for polishing articles so as to prepare their surfaces for electro-plating. (See *Plating*, *Electro*.)

For use, mops are charged with fine polishing material; as, rouge, tripoli, etc.

**Mopped.**—Polished by the action of a mop. (See Appendix—*Mop*, *Polishing*.)

**Morse Push.**—(See Appendix—*Push*, *Morse*.)

**Morse Tapper.**—(See Appendix—*Tapper*, *Morse*.)

**Motion, Electrostatic** — —Motion produced by means of an electrostatic field somewhat similar to the motion produced by means of a magnetic field.

Electrostatic motion may be produced by varying electrostatic fields placed at right angles to each other. When the force varies in accordance with the sine law, and the difference in phase varies by only 90 degrees, a uniform tendency to rotation is produced.

**Motion, Harmonic** — —A term sometimes employed in place of simple-harmonic motion. (See *Motion, Simple-Harmonic*.)

**Motion, Periodic** — —A term sometimes employed in place of simple-periodic motion. (See *Motion, Simple-Periodic*.)

**Motor, Constant-Potential** — —A motor designed for operation by means of a constant potential current.

Where the motor is to be operated at a constant speed, or by a constant potential circuit, such, for example, as an incandescent lighting circuit, it is generally made a plain, shunt-wound motor.

**Motor, Diphase** — —A motor which requires for its operation two diphase currents.

The armature of such a motor is always wound either with two separate circuits, or has two separate connections to the same common winding.

This term would appear preferable to the term two-phase motor.

**Motor, Dynamo** — —A constant current transformer or dynamotor. (See Appendix—*Dynamotor*.)

**Motor, Efficiency of Electric** — —The watts delivered at the motor pulley, divided by the watts supplied.

**Motor, Electric Street Railway, Bucking of** — —(See Appendix—*Bucking*.)

**Motor, Electrostatic** — —A motor driven by means of the induction of two named electrostatic fields at right angles to each other.

Generally, a motor driven by the action of electrostatic fields.

**Motor, Idle Wire of** — —(See Appendix—*Wire, Idle, of Armature of Motor*.)

**Motor, Induction** — —A motor in which the magnetic field is produced entirely by the

working current, as distinguished from a motor in which the field magnets are independently maintained.

An induction motor consists essentially of coils of wire and laminated iron discs so related to one another that the currents in the moving parts are induced by currents in the stationary parts.

**Motor, Magneto** — —A term formerly employed for a voltaic battery coupled in parallel.

The current furnished by such a battery being capable, when employed with suitable electro-magnets, to produce powerful magnetism, was called a magneto-motor. This word is generally used as below.

**Motor, Magneto** — —A motor whose field is produced by permanent magnets.

**Motor-Man** — —A word generally applied to the person who operates the motor car of street railway systems.

**Motor, Multiphase** — —A term sometimes employed in place of polyphase motor. (See Appendix—*Motor, Polyphase*.)

**Motor, Polyphase** — —A motor operated by means of polyphase currents.

**Motor, Polyphase, Unsymmetrical** — —An unbalanced polyphase motor; *i. e.*, a motor where one circuit carries a greater load than the other circuit or circuits.

**Motor, Single-Phase** — —A uni-phase motor.

The term uni-phase is preferable.

**Motor, Synchronous, Self-Starting** — —A motor of the synchronous type that is capable of self-starting.

**Motor, Three-Phase** — —A tri-phase motor. (See Appendix—*Motor, Tri-Phase*.)

The term tri-phase motor would appear to be preferable.

**Motor, Tri-Phase** — —A motor which requires for its operation three tri-phase currents.

The armature of such a motor is always wound either with three separate circuits or has three separate connections to a common winding.

**Motor, Two-Phase** — —A diphase motor. (See Appendix—*Motor, Diphase*.)

The term diphas motor would appear to be preferable.

**Motor, Uni-Phase** — — — A motor which requires for its operation a simple alternating current; *i. e.*, a current which is uni-phase.

The term uni-phase is preferable to the term single-phase.

**Mounting of Filament** — (See Appendix *Filament, Mounting of*.)

**Multi-Phase Alternator** — (See Appendix *Alternator, Multi-Phase*.)

**Multi-Phase Motor** — (See Appendix *Motor, Multi-Phase*.)

**Multiple Auto-reversible Tele-radio-  
phone** — (See Appendix *Tele-radiophone,  
Auto-reversible or Multiple*.)

**Multiple-Lightning Flash** — (See Appendix *Flash, Multiple-Lightning*.)

**Multiple-Parallel Circuit** — (See Appendix *Circuit, Multiple-Parallel*.)

**Multiplex Telegraph** — (See Appendix *Telegraph, Multiplex*.)

**Multiplex Telephony** — (See Appendix *Telephony, Multiplex*.)

**Multiplier, Astatic** — — — A term sometimes employed for an astatic galvanometer. (See *Galvanometer, Astatic*.)

**Multiplier, Dynamic** — — — A term formerly applied to a self-induction coil. (See Appendix *Coil, Induction, Self*.)

**Multiplier, Electro-Magnetic** — — — A term sometimes employed for Sweigger's Multiplier. (See *Multiplier, Sweigger's*.)

**Municipal System of Incandescent Electric Lighting** — (See Appendix *System, Municipal, of Electric Lighting*.)

**Mutually Induced Currents** — (See Appendix *Currents, Mutually Induced*.)

## N

**n** — — — A symbol sometimes employed for frequency.

**Natural Period** — (See Appendix *Period, Natural*.)

**Needle, Drift of** — — — The failure of the needle of a galvanometer to remain at its zero point when no current is passing through its coils, usually due to variation in the magnetic condition of the needle, or to variation in the torsion of the suspending fibre, local causes, etc.

**Needle Telegraph** — (See Appendix *Telegraph, Needle*.)

**Needle, Vertical Magnetic** — — — A term sometimes employed for a dipping needle. (See *Needle, Magnetic, Dipping*.)

**Negative Electrification** — (See Appendix *Electrification, Negative*.)

**Negative Fluid** — (See Appendix *Fluid, Negative*.)

**Negative Spark** — (See Appendix *Spark, Negative*.)

**Neutral Zone of Electrically Charged Insulated Conductor** — (See Appendix *Zone, Neutral, of Electrically Charged Insulated Conductor*.)

**Neutral Zone of Magnet** — (See Appendix *Zone, Neutral, of Magnet*.)

**Nipple on Negative Carbon** — — — A small projection formed at the end of the negative carbon directly opposite the positive carbon of a voltaic arc that has been established for some little time.

The nipple is formed at the end of the negative carbon directly opposite the crater in the opposing end of the positive carbon by the deposition of volatilized carbon from the positive electrode. The material of the nipple is pure graphite or plumbago.

If the ends of the carbons, that are thrown away from an electric arc lamp on trimming the lamp, be examined, they will be found to possess either a small crater or a small projection or nipple at their burned end.



Either of these ends, but especially the nipple at the negative carbon, is formed of pure graphite sufficiently soft to be readily used for some considerable time as a lead pencil.

**Node.**—A point of comparative rest in a vibrating body.

Since the position of an anti-node for a fundamental tone may be the position of the node for one of its harmonics, it is clear that the nodes are often necessarily only points of relative rest.

**Non-Automatic Repeater.**—(See Appendix—*Repeater, Non-Automatic.*)

**Non-Ferrie Inductance.**—(See Appendix—*Inductance, Non-Ferrie.*)

**Non-Polar Transformer.**—(See Appendix—*Transformer, Non-Polar.*)

**Northern Light.**—(See Appendix—*Light, Northern.*)

## O

**Ω.**—An abbreviation sometimes used for ohm, the practical unit of electric resistance.

**ω.**—A symbol sometimes used for angular velocity.

The defining equation is  $\omega = \frac{V}{L}$ .

**ohm.**—An abbreviation proposed for ohm-centimeter, the practical unit of resistance.

**Oersted, Proposed A. I. E. E. Definition for —**—A name proposed for the practical unit of magnetic reluctance.

A unit of magnetic reluctance having a value of one absolute unit.

This name was proposed by a Sub-Committee of the American Institute of Electrical Engineers at a Provisional Programme for the International Electrical Congress, held in Chicago, U. S. A., in 1893, on the occasion of the World's Columbian Exposition.

**Ohm, B. A. —**—A resistance of 14.4521 grammes of mercury in the form of a column of uniform cross-section (one square millimetre) and 104.8 centimetres in height at 0 degree C.

The above value of the ohm was adopted as the unit of the British Association at its meeting held in Edinburgh in August, 1892.

**Ohm, International —**—The value of the international ohm adopted at the Chicago Congress of 1893, as being the resistance column based upon the ohm equal to 10<sup>9</sup> units of resistance of the C. G. S. system of electro-magnetic units, and is represented by the resistance offered to an un-

varying electric current by a column of mercury at the temperature of melting ice 14.4521 grammes in mass, of a constant cross sectional area, and of the length of 106.3 centimetres.

**Ohm Mile.**—(See Appendix—*Mile, Ohm.*)

**Ohm, Proposed A. I. E. E. Definition for —**—The resistance offered at the temperature of melting ice by a column of mercury, 14.4521 grammes in mass, of a constant cross-sectional area and of a length of 106.3 centimetres.

**One-Way Door Trigger.**—(See Appendix—*Trigger, One-Way Door.*)

**Open-Circuit Transformer.**—(See Appendix—*Transformer, Open-Circuit.*)

**Opposing Electromotive Force.**—(See Appendix—*Force, Electromotive, Opposing.*)

**Optical Galvanometer.**—(See Appendix—*Galvanometer, Optical.*)

**Oscillator, Hertz's —**—A term sometimes employed for two insulated metallic plates, to which are attached metallic rods, terminated by rounded knobs or balls separated by an air gap or air space, through which a disruptive discharge passes.

The metallic plates represent the opposite coating of a Leyden jar. When employed as Hertz's oscillator each plate is connected to the terminal of a Ruhmkorff coil, and at each discharge electrical surges are produced, which cause waves to radiate from the plates into the surrounding ether.

**Oscillator, Hertz's Axial —**—A term sometimes employed for Hertz's linear oscil-



lator. (See Appendix—*Oscillator, Hertz's Linear.*)

**Oscillator, Hertz's Linear** — — A form of Hertz's oscillator in which a straight or linear conductor is employed instead of a plate as in the ordinary oscillator. (See Appendix—*Oscillator, Hertz's.*)

According to Lodge, a thunder cloud connected to the earth by means of a lightning rod forms a linear oscillator.

**Out-Put.**—The useful energy given out by a machine.

The out-put is generally taken in connection or in comparison with the in-put. When the useful or available electric energy of any source is

divided by the total electric energy, the value of a ratio, called the efficiency, is obtained. In this case the out-put, when divided by the total in-put, gives the efficiency. (See *Efficiency, Electric.*)

**Oven, Baking, Electrical** — — An electrically heated baking oven.

Almost any form of baking oven can be heated by means of electric heaters suitably placed therein.

**Overflow of Leyden Jar.**—(See Appendix — *Jar, Leyden, Overflow of.*)

**Overlap Test.**—(See Appendix — *Test, Overlap.*)

**Over-Maximal Contraction.**—(See Appendix—*Contraction, Over-Maximal.*)

## P

**P.**—A symbol proposed for power.

The defining equation is  $P = \frac{W}{T}$

**P.**—A symbol proposed for electric power.

The same symbol is proposed for mechanical power.

The defining equation is  $P = C E$ .

**p.**—A symbol proposed for pressure.

The defining equation is  $p = \frac{F}{S}$

**Φ.**—A symbol employed for flux of magnetic force.

The defining equation is  $\Phi = \oint \mathbf{B} \times \mathbf{S}$ .

**Pacinotti Teeth.**—(See Appendix—*Teeth, Pacinotti.*)

**Page Effect.**—(See Appendix—*Effect, Page.*)

**Pair, Thermo** — — A thermo couple. (See *Couple, Thermo-Electric.*)

**Pair, Thermo-Electric** — — A term sometimes employed in place of thermo-electric couple. (See *Couple, Thermo-Electric.*)

**Pair, Voltaic** — — A term sometimes employed in place of voltaic couple. (See *Couple, Voltaic.*)

**Pan, Backing** — — A pan in which the copper shell of an electrotpe is placed, in order to receive its backing of type metal.

When the copper shell has been placed in the backing-pan, for the purpose of receiving its backing of type-metal, it has its back covered with sheets of tin-foil. It is then placed along with the backing-pan in the melting-pot, a pot filled with melted type-metal, on which it is permitted to float until the covering of tin-foil is melted. It is now removed and placed on a level table where the molten metal from the melting pot is poured over it until a layer of the required thickness is obtained.

**Pan-Telephone.**—(See Appendix — *Telephone, Pan.*)

**Parallel-Arc Circuit.**—(See Appendix—*Circuit, Parallel-Arc.*)

**Parallel Connection of Alternators.**—(See Appendix—*Alternators, Parallel Connection of.*)

**Parallel Working of Alternating Dynamo-Electric Machines.**—(See Appendix—*Machines, Dynamo-Electric, Alternating, Parallel Working of.*)

**Paramagnetized.**—Endowed with paramagnetic properties. (See *Paramagnetism.*)

**Passive Resistance.**—(See Appendix—*Resistance, Passive.*)

**Path, Magnetic Flux** — —The path or circuit taken by the lines of magnetic force or flux.

**Pear Push.** — (See Appendix — *Push, Pear.*)

**Peltier's Cross.**—(See Appendix—*Cross, Peltier's.*)

**Pencil, Carbon** — —A term sometimes employed for a carbon rod.

A rod or cylinder of carbon, as distinguished from a plate.

**Pendant Socket.**—(See Appendix—*Socket, Pendant.*)

**Pendulum, Electric** — —A term sometimes employed for a pith ball electroscope, so arranged as to move to-and-fro like an ordinary pendulum.

This use of the term is to be avoided, since the word, as primarily employed, signifies either a pendulum driven by electric impulses, or a pendulum so arranged as to produce timed impulses.

The term electroscopic or electrostatic pendulum would appear preferable. (See *Pendulum, Electric.*)

**Pentad Atom.**—(See Appendix — *Atom, Pentad.*)

**Percentage Conductivity of Wire.**—(See Appendix — *Conductivity, Percentage, of Wire.*)

**Period.**—The interval of time between two successive passages of a vibration through a given point of its path taken in the same direction.

**Period, Natural** — —The period of harmonic frequency which brings it to the same value as that of the fundamental frequency.

The natural period, according to Lodge, is represented by the following formula.

$$T = 2\pi \sqrt{LC} \times 10^{-3}$$

Where T = the period in seconds.

L = the coefficient of self-induction in henries.

C = the capacity in micro-farads.

The natural period can be varied either by varying the self-induction of the circuit or by varying its capacity.

**Period, Variable, of Telegraph Line** — —The time required for a current in a telegraph line to reach a constant strength after the circuit through it is closed.

**Periodic Motion.**—(See Appendix—*Motion, Periodic.*)

**Periodicity of Alternation.**—(See Appendix—*Alternation, Periodicity of.*)

**Permanent Laminated Magnet.**—(See Appendix — *Magnet, Laminated, Permanent.*)

**Permanent Telegraphic Signal.**—(See Appendix — *Signal, Telegraphic, Permanent.*)

**Permeation.**—A word sometimes employed for the number of lines of magnetic force per square centimetre.

**Permittance.**—A word proposed for dielectric capacity. (See Appendix—*Capacity, Specific Dielectric.*)

Electrostatic induction takes place between the two coatings of a condenser, or between two copper conductors across the dielectric between them. Dielectrics differ greatly in their ability to permit this influence to pass through them, and this difference has been called the dielectric capacity, the specific inductive capacity, the inductive capacity, or the permittance. (See *Capacity, Specific Inductive.*)

**Permittivity.**—A word sometimes employed for specific permittance. (See Appendix—*Permittance.*)

**Phantom, Magnetic** — —A term sometimes employed for magnetic figures. (See *Figures, Magnetic. Field, Magnetic.*)

**Phantom Streams.** — (See Appendix — *Streams, Phantom.*)

**Phase.**—The fractional part of a period which has passed since a vibrating body last passed through the extreme point of its path in the positive direction.

**Phase Angle.**—(See Appendix—*Angle, Phase.*)

**Phase Windings.**—(See Appendix—*Windings, Phase.*)

**Phenomena.**—Plural of phenomenon.

**Phonogram.**—A dispatch transmitted by means of a telephone.

The word phonogram corresponds to the word telegram.

This word is also used for the record produced by a phonograph.

**Phonoplex Telegraph.**—(See Appendix—*Telegraph, Phonoplex.*)

**Phosphorescent Lamp.**—(See Appendix—*Lamp, Phosphorescent.*)

**Phosphorus, Mercurial** — —A term employed by Hawksbee in 1795 for the light produced by the motion of a column of mercury in an exhausted tube.

The light so produced is due to electricity caused by the friction of the mercury against the walls of the tube. Such a light is often seen in the Torricellian vacuum which exists in the space above the mercurial column in a barometer tube.

**Photo-Electric Alarm.**—(See Appendix—*Alarm, Photo-Electric.*)

**Photo-Electric Impulsion Cell.**—(See Appendix—*Cell, Photo-Electric Impulsion.*)

**Photometer, Spectro** — —A form of photometer suitable for measuring the relative intensities of lights of different qualities.

A spectro-photometer consists essentially of means by which the two parallel beams of light that are to be compared are passed side by side through the same prism. The field is then limited to a single color, and the respective intensities of the two lights as regards this particular character of radiation are then compared.

**Photo-Micrography, Electric** — —The art of photographing microscopic images by means of the electric light.

**Physiologist, Electro** — —One skilled in the art of electro-physiology. (See *Physiology, Electro.*)

**Pins, Core, of Magnet** — —Small pins of copper or other non-magnetic material placed in the cores of an electro-magnet at its poles for the purpose of preventing sticking.

**Planer, Electric Deck** — —A trically driven rotary cutter or planer, for the ready planing of the deck of a

Fig. 579 shows an electric deck planer. The rotary cutter revolves at some three

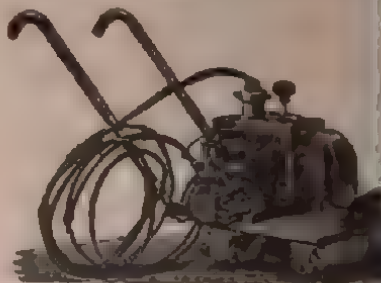


Fig. 579. An Electric Deck Planer.

revolutions per minute, and is so arranged as to be readily adapted for a varying depth of

**Plastic-Circuit Microphone.**—(See Appendix—*Microphone, Plastic-Circuit.*)

**Plates, Exhausted, of Storage Cell** — —A phrase employed to characterize the condition of the plates of a storage battery when they have furnished all the current they are capable of producing without being recharged. (See *Plates of Secondary or Storage Cell, Forming of.*)

**Plates, Field** — —A term sometimes applied to the plates of tin-foil, on a Holtz influence machine, which act as conductors. (See *Machine, Toppler-Holtz.*)

**Plates, Formed, of Storage Cell** — —A phrase employed to characterize the condition of the plates of a new storage battery when they have been prepared for service by a preliminary process of charging and discharging. (See *Plates of Secondary or Storage Cell, Forming of.*)

**Plating Trough.**—(See Appendix—*Trough, Plating.*)

**Plug, Attachment** — —A plug used for attaching and connecting a flexible cord to a lamp socket or receptacle.

**Plus Charge.**—(See Appendix—*Charge, Plus.*)

**Galvanometer.**—(See Appendix—*meter, Pocket.*)

**Indifferent** — —A term sometimes employed for the neutral point of a (See *Line, Neutral, of a Magnet.*)

**Smashing, of Incandescent Electric Lamp** — —The point in the life of an incandescent electric lamp at which it is more economical to replace it by another than it is to keep it any longer

an incandescent electric lamp can be used for many thousand hours. It is, however, that, so far as economy is concerned, is more economical after a certain number of hours burning to replace it by another than to continue it any longer in use. This, however, is by no means generally

the length of life will, of course, depend on the condition of the lamp and the potential to which it is exposed. Cases, however, may be met where it will be more economical to keep it under an increased difference of potential to cease using it.

**Aurora.**—(See Appendix—*Aurora,*

**Transformer.**—(See Appendix—*meter, Polar.*)

**Galvanic Battery.**—(See Appendix—*Polarization.*)

**Galvanic Gas** — —A term sometimes employed for that form of polarization due to the collection of a gas, hydrogen, on the negative plate. (See *Gas, Polarization of.*)

**Galvanic Indicator.**—(See Appendix—*Polarized.*)

**Galvanic Indicator.**—(See Appendix—*Indicator.*)

**Magnetic, Blue** — —A term sometimes employed for that pole of a magnet which points approximately towards the geographical south pole.

the confusion arising from this non-uniform term is still further increased by the fact that some writers use the word blue-pole for

the pole which points towards the geographical north pole.

**Pole, Magnetic, Red** — —A term sometimes employed for the pole of a magnet which points approximately towards the geographical north pole.

Sometimes used in opposite sense. (See Appendix—*Pole, Magnetic, Blue.*)

**Pole, Magnetic, Unmarked** — —A term sometimes employed for the south pole of a magnet.

**Pole, Resultant Magnetic** — —A term sometimes employed for a consequent pole. (See *Pole, Consequent.*)

**Polishing Bob.**—(See Appendix—*Bob, Polishing.*)

**Polishing Mop.**—(See Appendix—*Mop, Polishing.*)

**Polyphase Apparatus.**—(See Appendix—*Apparatus, Polyphase.*)

**Polyphase Armature.**—(See Appendix—*Armature, Polyphase.*)

**Polyphase Currents.**—(See Appendix—*Currents, Polyphase.*)

**Polyphase Generator.**—(See Appendix—*Generator, Polyphase.*)

**Polyphase Motor.**—(See Appendix—*Motor, Polyphase.*)

**Polyphase Working.**—(See Appendix—*Working, Polyphase.*)

**Polyphased Alternating Currents.**—(See Appendix—*Currents, Polyphased, Alternating.*)

**Positive Electrification.**—(See Appendix—*Electrification, Positive.*)

**Positive Fluid.**—(See Appendix—*Fluid, Positive.*)

**Positive Spark.**—(See Appendix—*Spark, Positive.*)

**Potash Brush.**—(See Appendix—*Brush, Potash.*)

**Potential, Scalar** — —A potential possessing magnitude and sign without directive signification, as distinguished from a vector potential, which possesses both direction and



magnitude. (See Appendix—*Potential, Vector*.)

**Potential, Vector** — — A potential possessing directive properties and one that may be derived by the process of summation from vectors, or elementary directed quantities, as opposed to a scalar potential, which possesses undirected magnitude. (See Appendix—*Potential, Scalar*.)

**Potentiometer, Alternating Current** — — A form of potentiometer designed for measuring the differences of potential in alternating current circuits.

**Power Factor**.—(See Appendix—*Factor, Power*.)

**Power, Man** — — A unit of power equal to  $\frac{1}{2}$  horse-power, or about 74½ watts.

**Pressure, Electric** — — A term sometimes loosely employed for difference of potential or electromotive force. (See *Potential, Difference of*.)

The terms potential difference and electromotive force are preferable terms. The use of the term electric pressure can well be abandoned. The term electric pressure, however, is much to be preferred to the very objectionable term electric tension, or difference of tension.

**Primary Cell**. — (See Appendix—*Cell, Primary*.)

**Primary Electric Clock**.—(See Appendix—*Clock, Primary Electric*.)

**Primary Electric Heater**.—(See Appendix—*Heater, Primary Electric*.)

**Primary Spiral of Induction Coil**.—(See Appendix—*Spiral, Primary, of Induction Coil*.)

**Process, Building, for Moulds of Electrotypes** — — A process for bringing up the blank spaces in the mould of an electrotype by the use of wax, melted by a building iron—the high places thus built up becoming depressions in the finished plate.

**Process, Coking, for Filament of Incandescent Electric Lamp** — — A process

for converting the carbon of an incandescent filament into coke, by subjecting it, while in a vacuum, to the prolonged heating action of a powerful electric current. (See Appendix—*Filament, Coked*.)

**Process, Quicking** — — A term employed in electro-plating for a process by means of which an article that is to be electro-plated with silver, is previously coated with a layer of mercury by dipping it into a quicking solution, *i. e.*, a solution of salt of mercury. (See *Solution, Quicking*.)

**Process, Stopping-Off** — — A process employed in electro-plating by means of which an article which is to be electro-plated on portions only of its surface with one metal, and on other portions with another metal, is first completely covered by an electro-plating of the cheaper metal, and is then stopped-off, by covering with a coating of non-conducting varnish such portions only of its surface as are not to receive the deposit of the dearer metal. (See *Stopping-Off*.)

**Process, Stopping-Out** — — A process employed in electrotyping by means of which those parts of an electrotpe mould that are not to be copied in the electrotpe are covered with clean hot wax.

The stopping-out process is similar to the stopping-off process in electro-plating. Wherever the black lead or plumbago surface is covered with clean wax, the copper fails to be deposited.

**Proposed A. I. E. E. Definition for Impressed Electromotive Force**.—(See Appendix—*Force, Electromotive, Impressed, Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Gauss**.—(See Appendix—*Gauss, Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Henry**.—(See Appendix—*Henry, Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Inductivity**.—(See Appendix—*Inductivity, Proposed A. I. E. E. Definition for*.)



**Proposed A. I. E. E. Definition for Mho.**—(See Appendix—*Mho*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Mutual Inductance.**—(See Appendix—*Inductance, Mutual*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for North Pole of Magnet.**—(See Appendix—*Magnet, North Pole of*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Oersted.**—(See Appendix—*Oersted*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Ohm.**—(See Appendix—*Ohm*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Polyphase Alternating Current.**—(See Appendix—*Current, Polyphase Alternating*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Reluctivity.**—(See Appendix—*Reluctivity*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Self-Inductance.**—(See Appendix—*Inductance, Self*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for South Pole of Magnet.**—(See Appendix—*Magnet, South Pole of*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Triphase Alternating Current.**—(See Appendix—*Current, Triphase Alternating*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Volt.**—(See Appendix—*Volt*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Watt.**—(See Appendix—*Watt*, *Proposed A. I. E. E. Definition for*.)

**Proposed A. I. E. E. Definition for Weber.**—(See Appendix—*Weber*, *A. I. E. E. Definition for*.)

**Protection, Conduction Lightning** —  
—The protection of any instrument from the passage of a current due to lightning around its coils, and so disturbing the magnetism of the needle.

**Protection, Insulation Lightning** —  
—The protection of any instrument from the jumping of a spark across it from layer to layer.

**Protective Action.**—(See Appendix—*Action, Protective*.)

**Protective Throw.**—(See Appendix—*Throw, Protective*.)

**Protector, Cage, for Lightning Discharges** — — A term sometimes employed for protecting sheaths for lightning discharges. (See *Sheath, Protective*.)

The method consists essentially in surrounding the body to be protected by conducting wires in the form of a cage.

**Protector, Conduction Lightning** — —  
A lightning protector by means of which a current is prevented from passing around the coil of a galvanometer or other needle instrument, and thus disturbing the magnetism of the needle.

**Protector, Insulation Lightning** — —  
A lightning protector by means of which a discharge is prevented from jumping across the coil of an instrument from layer to layer, and thus damaging the insulation.

**Pull Bell, Circuit Closer for** — — A device suitable for attachment to a mechanical door pull, so as to make an electrical contact for the ringing of an electric bell, without preventing the original bell from being operated by the mechanical pull.

**Pull-Off, Double Curve** — — In a system of electric street railways a hanger supported by a lateral strain in opposite directions, used generally at the ends of both single and double curves and at intermediate points on double track curves.

A double curve hanger.

**Pull-Off, Single Curve** — — In a system of electric street railways a hanger supported

is the distance of a point from the center of the circle, and is the same for all points on the circle.

A circle is a curve.

**Perpendicular Lines.**—Two lines are perpendicular when they intersect at right angles.

**Right Angles.**—Two angles are right angles when they are equal to each other.

**Right Lines.**—Two lines are right lines when they are parallel to each other.

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The radius of a circle is  $r$ .

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Araians to the torpedo or electrical ray.  
(See *Torpedo, Electric. Ray, Electric.*)

**Radial Current.**—(See Appendix—*Current, Radial.*)

**Radian.**—Unit angle.

An angle such that its circular arc is equal in length to its radius.

Its value in degrees is approximately  $57^{\circ} 17' 45''$ .

The radian is not employed in practical applications, since the degree is the unit angle in ordinary use, but in mathematics angles are nearly always discussed in terms of the radian.

**Radian Per Second.**—Unit angular velocity of a rotating body.

**Radiation, Efficiency of** — — A term sometimes employed to represent the ratio of the non-luminous to the luminous radiation in the case of a body emitting light and heat.

The efficiency of the ordinary sources of artificial light is very low. The efficiency of the radiation of the firefly or glow-worm is very high, practically all its radiation belonging to the luminous type.

**Radiation, Electric** — — The transference of electric energy by means of waves set up in the surrounding ether.

During the oscillatory discharge of a Leyden jar, or, in general, during any disruptive discharge, the electricity surges or rushes to and fro, sending out or radiating its energy into the surrounding ether by means of waves.

It does this until all its energy is either directly dissipated in this manner, or is converted into heat in the conductor, which is afterwards dissipated as heat-waves.

The lengths of the waves thus sent out into space by means of direct radiation of the electrical energy depend on a variety of circumstances, the most important of which are:

(1.) On the capacity of the condensers.

(2.) On the self-induction of the radiating system.

**Radiation, Intensity of** — — The ratio existing between the amount or quantity of radiation and the surface.

**Radiation, Quality of** — — Variations in the radiation due to differences, both in the

various wave lengths present and in the polarization.

**Radiation, Selective** — — Radiation limited to waves of a particular wave length.

The character of the radiation depends.

(1.) On the nature of the body.

(2.) On the condition of its surface.

(3.) On the temperature.

Langley has shown that in the case of a luminous body the proportion existing between the visible radiation and the invisible radiation varies greatly in different cases. In the case of a gas flame, 2.4% of the radiation is luminous. In the case of the arc light about 10 per cent. is luminous, while in the light emitted by the firefly or the glow-worm practically all the radiation is luminous.

**Radiator, Electric** — — An electric heater so placed as to radiate its heat into the room or space to be heated.

Any electric heater applied to heat the air or space that surrounds it may be regarded as an electric radiator.

Electric radiators are generally so placed as to prevent direct contact with their heated surfaces.

**Radiophonic Sounds.**—(See Appendix—*Sounds, Radiophonic.*)

**Railroad, Conductor System for** — — A system for the propulsion of cars by means of electricity taken from a conductor placed near the road. (See *Railroads, Electric, Dependent System of Motive Power for.*)

**Railway, Electric, Battery System for** — — A system for the propulsion of cars by means of electricity derived from storage or secondary batteries placed on the cars. (See *Railroads, Electric, Independent System of Motive Power for.*)

**Railway Generator.** — (See Appendix—*Generator, Railway.*)

**Raindrops, Electrical Aggregation of** — — The coalescence of a number of separate raindrops into a single drop by the action of electricity.

Rayleigh has observed the fact that if a vertical water-jet is subjected to the influence of an electrified stick of sealing wax held a short dis-

tance from the drop, the jet at once shrinks upon itself and greatly changes its appearance, a great number of separate drops collecting into single larger drops.

Examining the drops by means of intermittent illumination the coalition of the separate drops can be readily seen. When no difference of potential exists between the separate drops they do not unite or coalesce, but when a difference of potential exists, coalescence occurs, and, since such coalescence causes an increased difference of potential, the drops rapidly increase, both in size and potential difference.

**Ratio of Conversion.**—(See Appendix—*Conversion, Ratio of.*)

**Ratio of Transformation.**—(See Appendix—*Transformation, Ratio of.*)

**Rays, Anodic, of Vacuum Tube** — — The rays of light which appear in the neighborhood of the anode of a vacuum tube through which a rapid electric discharge is passing.

**Rays, Kathodic, of Vacuum Tube** — — The rays of light which appear in the neighborhood of the cathode of a vacuum tube through which a rapid electric discharge is passing.

**Reactance.**—A term proposed by Hospitalier for a quantity of the same dimensions as the resistance, which does not absorb energy, and the square of which added to the square of the resistance gives the square of the impedance to simple harmonic currents.

Calling  $C_{eff}$ , the effective current,  $E_{eff}$ , the effective electromotive force,  $\omega$ , the pulsation, or  $2\pi$  times the frequency, then—

$$C_{eff} = \frac{E_{eff}}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega R}\right)^2}}.$$

The factor in the parenthesis is what Hospitalier proposes to call the reactance.

**Reaction, Armature** — — The reactive magnetic influence produced by the current in the armature of a dynamo or motor upon the magnetic circuit of the machine.

**Red Magnetic Pole.**—(See Appendix—*Pole, Magnetic, Red.*)

**Redressed.**—Commuted or caused to take the same direction.

The commutator redresses or commutes the currents in the armature and causes them to flow in the same direction.

**Regenerative Cell.**—(See Appendix—*Cell, Regenerative.*)

**Region, Equatorial, of Magnet** — — A term sometimes employed for the portions of a magnet which lie near the equator. (See *Magnet, Equator of.*)

**Registering Declination Magnetometer.**—(See Appendix—*Magnetometer, Registering Declination.*)

**Regulating Socket.**—(See Appendix—*Socket, Regulating.*)

**Relay Contact.**—(See Appendix—*Contact, Relay.*)

**Relay, Kick of** — — (See Appendix—*Kick of Relay.*)

**Relay, Polar, Telegraphic** — — A telegraphic relay provided with a polarized armature. (See *Armature, Polarized.*)

**Reluctancy.**—An alternative word proposed for reluctivity. (See *Reluctivity, Reluctance, Magnetic.*)

**Reluctivity, Proposed A. I. E. E. Definition for** — — The reciprocal of permeability.

**Remanent Magnetism.**—(See Appendix—*Magnetism, Remanent.*)

**Repeater, Automatic** — — A telegraphic repeater which acts automatically. (See *Repeaters, Telegraphic.*)

**Repeater, Button** — — A form of manual repeater. (See *Repeaters, Telegraphic.*)

**Repeater, Electro-Magnetic, Callan's** — — A term formerly applied to a variety of vibrating contact breaker.

**Repeater, Manual** — — A telegraphic repeater which is operated by hand. (See *Repeaters, Telegraphic.*)

**Repeater, Non-Automatic** — — A term sometimes employed for manual repeater. (See *Repeaters, Telegraphic.*)

**Repeating Telegraphic Station.**—(See Appendix—*Station, Repeating Telegraphic.*)

**Repulsion Electrometer.**—(See Appendix—*Electrometer, Repulsion.*)

**Residue, Electric** — —A term proposed for residual charge.

The term electric residue would appear to be entirely unnecessary.

**Resistance, Apparent** — —A term sometimes employed for the impedance of a circuit or the resistance it offers to the passage of an alternating current.

**Resistance, Conduction** — —The resistance offered by a conductor to the passage of an electric current.

**Resistance, Conductor** — —A term frequently employed for copper resistance. (See Appendix—*Resistance, Copper.*)

**Resistance, Contact** — —A resistance produced by the contact of two surfaces.

**Resistance, Copper** — —A term frequently employed for expressing the resistance of a telegraphic conductor.

The value of the copper resistance is generally expressed in ohms-per-mile, ohms-per-knot or ohms-per-kilometre.

**Resistance, Electric, of Metals, Effect of Temperature on** — —A change in the resistance of a metal following a given change in temperature.

At decreasing temperatures an increase occurs in the electric conducting power of the metals.

Dewar, by means of the intense cold produced by liquefied oxygen, found that at very low temperatures all pure metals increase in their conducting power as the temperature decreases. The temperature curve is such that, the resistivity of pure metals would be zero at, or even before, the absolute zero of temperature. In such a case, if a wire or conductor of pure metal were placed in the approximately absolute zero of interstellar space, electricity would pass through it without loss. This must, however, be regarded only as a hypothesis.

According to Dewar, most non-conducting bodies show a conductivity decreasing with the temperature.

**Resistance of Telegraphic Leak.**—(See Appendix—*Leak, Telegraphic, Resistance of.*)

**Resistance, Passive** — —A term sometimes employed for the ohmic resistance of a circuit. (See *Resistance, Ohmic.*)

**Resistance, Specific Magnetic** — —A word proposed for reluctivity. (See *Reluctivity.*)

**Resistance, Transition** — —A term formerly employed for the resistance experienced by a voltaic cell shortly after closing a circuit.

The transition resistance was inferred from the decrease in the current strength, and was formerly attributed to a change in the character of the electrode. It is now generally ascribed to the electromotive force of polarization.

This term is also employed in a somewhat similar sense in electro-therapeutics. (See *Resistance, Transition.*)

**Resistivity.**—A term proposed for specific resistance. (See *Resistance, Specific.*)

Resistivity is the inverse of specific conductivity.

**Resonance, Acoustic** — —The excitement or production of waves or vibrations of sound in an elastic body by means of successive impulses received by such body from the sound waves striking it.

Acoustic resonance is a particular case of sympathetic vibrations. Like all cases of such vibrations, there must exist between the sonorous body in which the waves of vibrations are excited, and the body which is producing the exciting waves, an identity of wave length; or, in other words, there must exist between the two strict synchronism, so that the effects of timed impulses may be permitted.

**Resonant Circuit.**—(See Appendix—*Circuit, Resonant.*)

**Resultant Fault.**—(See Appendix—*Fault, Resultant.*)

**Resultant Magnetic Pole.**—(See Appendix—*Pole, Resultant Magnetic.*)

**Retarding Disc.**—(See Appendix—*Disc, Retarding.*)

**Reversals.**—In telegraphy, alternate current signals transmitted for the purpose of



adjustment; as, for example, in obtaining a duplex balance.

**Reversible Heating Effect of Electricity.**—(See Appendix—*Electricity, Reversible Heating Effect of.*)

**Rheostat, Adjustable** — An adjustable resistance, in a compound-wound dynamo-electric machine, employed to adjust compounding for a greater or less than tested speed or a greater or less wiring loss.

A term sometimes employed for a rheostat, or a resistance that can readily be adjusted or altered. (See *Rheostat.*)

Strictly speaking, any rheostat is an adjustable resistance; therefore, this latter use of the term adjustable rheostat would seem to be unnecessary.

**Ribbon Induction Coil.**—(See Appendix—*Coil, Induction Ribbon.*)

**Right-Hand Trolley Switch.**—(See Appendix—*Switch, Right-Hand Trolley.*)

**Right-Handed Helix.**—(See Appendix—*Helix, Right-Handed.*)

**Right-Handed Rotation.**—(See Appendix—*Rotation, Right-Handed.*)

**Right-Handed Spiral.**—(See Appendix—*Spiral, Right-Handed.*)

**Ring, Galvanic** — A term sometimes applied to a galvanic, or, more properly speaking, voltaic circuit. (See *Circuit, Voltaic.*)

**Ripple Marks.**—(See Appendix—*Marks, Ripple, Electrical.*)

**Rise.**—In interior house wiring that portion of a conductor which rises vertically from one floor to another.

**Rocking Switch.**—(See Appendix—*Switch, Rocking.*)

**Rosette, Colling** — A ceiling block of ornamental and rosiform design.

**Rotary Converter.**—(See Appendix—*Converter, Rotary.*)

**Rotary Transformer.**—(See Appendix—*Transformer, Rotary.*)

**Rotation, Electro-Dynamic** — "The rotation of a magnetic field produced as the resultant of two or more magnetic or magnetizing forces of variable intensity acting at an angle to one another, whose maxima do not coincide, but whose periods are the same."  
—Gutmann.

**Rotation, Left-Handed** — A rotation the direction of which is opposite to that of the hands of a watch when one looks directly at the face of the watch.

**Rotation, Right-Handed** — A rotation the direction of which is the same as that of the hands of a watch when one looks directly at the face of the watch.

A direction the same as that of an ordinary right-handed screw, when we turn the upper side of the right-hand outwards.

**Rubber Tape.**—(See Appendix—*Tape, Rubber.*)

**Rumble.**—A barrel or other hollow box revolved by mechanical power in which small articles that are to be electro-plated are placed for the purpose of polishing them.

When subjected to the rotation of the barrel the articles became polished by friction against one another. Some dry sawdust is frequently placed in the barrel, to aid in the polishing process.

**Running Torque of Motor.**—(See Appendix—*Torque, Running, of Motor.*)

## S

**S**—A symbol proposed for surface.

The defining equation is  $S = L \times L$ .

**s**—An abbreviation proposed for second, the C. G. S. unit of time.

**S. N. Telegraphic Instrument.**—(See Appendix—*Instrument, S. N., Telegraphic.*)

**S. P. Cut-Out.**—(See Appendix—*Cut-Out, S. P.*)

**Sag of Conductor or Line Wire.**—(See Appendix—*Conductor or Line Wire, Dip of.*)

**Scalar Potential.**—(See Appendix—*Potential, Scalar.*)

**Secondary Spiral of Induction Coil.**—(See Appendix—*Spiral, Secondary, of Induction Coil.*)

**Section Box.**—(See Appendix—*Box, Section.*)

**Segment, Dark, of Aurora** — — — A dark or non-gluminous portion of the sky in the neighborhood of an aurora.

**Segment, Unlighted, of Aurora** — — — A term employed by Nordenskjöld in place of dark segment of aurora. (See Appendix—*Segment, Dark, of Aurora.*)

**Selective Emission.**—(See Appendix—*Emission, Selective.*)

**Selective Radiation.**—(See Appendix—*Radiation, Selective.*)

**Selective Signal.**—(See Appendix—*Signal, Selective.*)

**Selective Signalling Apparatus.**—(See Appendix—*Apparatus, Selective Signalling.*)

**Self-Compounding Polyphase Generator.**—(See Appendix—*Generator, Self-Compounding Polyphase.*)

**Self-Induction Coil.**—(See Appendix—*Coil, Induction, Self.*)

**Self-Starting Synchronous Motor.**—(See Appendix—*Motor, Synchronous, Self-Starting.*)

**Semaphoric Electroscop.**—(See Appendix—*Electroscope, Semaphoric.*)

**Semi-Circular Deviation of Mariner's Compass.**—(See Appendix—*Deviation, Semi-Circular, of Mariner's Compass.*)

**Semi-Conductors.**—(See Appendix—*Conductor, Semi.*)

**Sensitiveness of Telephone.**—(See Appendix—*Telephone, Sensitiveness of.*)

**Separable Conducting Cord Tip.**—(See Appendix—*Tip, Conducting Cord, Separable.*)

**Separate-Coil Alternator.**—(See Appendix—*Alternator, Separate-Coil.*)

**Separate-Coil Alternating Dynamo-Electric Machine.**—(See Appendix—*Ma-*

*chine, Dynamo-Electric, Separate-Coil Alternating.*)

**Separately-Excited Alternating Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Separately-Excited Alternating.*)

**Separately-Excited Alternator.**—(See Appendix—*Alternator, Separately-Excited.*)

**Separator, Electro-Magnetic** — — — A device for separating the useful ore from the dross in low grade finely granulated iron ores.

**Septum.**—A wall or diaphragm through which osmotic diffusion can take place. (See *Osmose. Osmose, Electric.*)

**Series, Branched** — — — A term sometimes employed in place of series-multiple. (See *Series-Multiple.*)

**Series Connection of Alternators.**—(See Appendix—*Alternators, Series Connection of.*)

**Series, Potential, Dynamos Coupled in** — — — A term sometimes employed in telegraphy for a particular coupling of dynamo-electric machines in series.

In the application of a number of dynamo-electric machines to the operation of telegraphic lines in a central station, where a number of different lines enter or leave the station, different voltages are required on the different lines. These different voltages are most readily obtained by coupling the machines in what is called potential series.

In potential-series coupling, the dynamos are connected together in series, that is, the positive brush of one dynamo is connected to the negative brush of another, its positive brush to the negative of another, and so on throughout the series. One terminal of the battery of dynamos is grounded, and the other connected to the line. The terminals of the various telegraphic lines are then connected to points of junction of contiguous dynamos where their opposite brushes are connected. By these means the requisite difference of potential is readily obtained.

**Series Working of Alternating Dynamo-Electric Machines.**—(See Appendix—*Machines, Dynamo-Electric, Alternating, Series Working.*)

**Service Block.**—(See Appendix—*Block, Service.*)

**Shackle Insulator.**—(See Appendix—*Insulator, Shackle.*)

**Shading, Magnetic** — —A term sometimes employed for magnetic screening. (See *Screening, Magnetic.*)

**Sheath, Closed-Conducting, for Lightning Protection** — —A form of lightning conductor proposed by Maxwell, consisting essentially of a net-work or cage-like conductor surrounding the house or building to be protected.

The theory for the protection of a building by means of a conducting sheath is based on the well known fact that there is no trace of electrostatic charge inside a hollow conductor.

It is now well known that there are circumstances under which the closed-conducting circuit does not thoroughly protect a building on which it is placed. If the number of such circuits is sufficiently great so as to form a close-meshed cage, the protection thus afforded is excellent. Such a sheath, however, might be dangerous to touch.

Lodge, who has studied the matter of lightning protection very thoroughly, thus humorously remarks concerning the system of sheath lightning protection:

"It would be unpleasant, when you are driven home out of a storm, to find it so highly charged as to knock you down directly you tried to enter. An earth connection is necessary as well."

**Shell, Complex-Magnetic** — —A magnetic shell whose strength varies from one part to another.

A complex magnetic shell will result from the overlapping of a number of simple magnetic shells.

**Shell, Copper, of Electrotypo** — —A thin sheet of electrolytically deposited copper.

The copper shell is rendered sufficiently rigid for use by being covered with a backing of type metal.

In order to permit this metal readily to adhere to the back of the shell it is thoroughly cleansed and then covered on the back with sheets of tin-foil, which are melted in the backing-pan preparatory to receiving the coating of type metal.

**Shell, Simple Magnetic** — —A magnetic shell whose strength is everywhere equal.

**Shifting of Spot of Light.**—A movement of a spot of light on a scale produced by other causes than those acting during the proper operation of the instrument, and causing the spot of light to move away from its true zero position.

In the case of a galvanometer the spot of light, instead of remaining at the zero point, shifts or moves from one side to another of the zero point.

This movement is sometimes called the drifting of the zero point.

The shifting of the spot of light is, of course, caused by the drift of the needle.

**Shunting Air Gap.**—(See Appendix—*Gap, Air, Shunting.*)

**Shunt-Out.**—A cut-out device for removing an electro-receptive device from a circuit, without breaking the circuit, by providing a short circuit between its terminals.

An electro-magnetic cut-out provides a shunt-out of the device it is desired to cut-out. It will be seen, however, that all a shunt-out does is to provide a by-path, the resistance of which is so small as compared with the resistance of the device cut-out, that practically all the current flows past the device through the shunt path, thus practically cutting it out from the circuit; or, more properly speaking, cutting it out from the operative current.

**Side Arms.** — (See Appendix — *Arms, Side.*)

**Signal, Individual** — —In any system of electric communication devices by means of which bells or other signals, at two or more stations electrically connected in the same circuit, are not operated at all of the stations by the calls sent over the line to the call bell at any particular station, but in which each particular bell is only operated by its own call to the exclusion of the other calls.

**Signal, Selective** — —A term sometimes employed in place of individual signal. —(See Appendix—*Signal, Individual.*)

**Signal, Telegraphic, Audible** — —Telegraphic signals that can be heard.

Examples of audible telegraphic signals are to be found in the signals given by various sounders of the Morse type.

The signals of electric bells are also audible signals.

**Signal, Telegraphic, Evanescent** — —  
Telegraphic signals that leave no permanent record.

Examples of evanescent telegraphic signals are found in the audible signals produced by most forms of telegraphic sounders.

**Signal, Telegraphic, Permanent** — —  
Telegraphic signals that are recorded by any means which leaves a permanent record.

The various forms of recording or registering apparatus employed in telegraphy produce permanent signals.—(See *Recorder, Morse. Recorder, Chemical, Bain's. Recorder, Siphon. Register, Telegraphic.*)

**Signal, Telegraphic, Visual** — —Telegraphic signals that can be seen.

Examples of visual telegraphic signals are to be found in the various galvanometric receiving apparatus employed in cable telegraphy, or, in general, in needle telegraphy. The signals received on the siphon recorder, for example, are visible signals. (See *Recorder, Siphon.*)

**Simple Alternating or Two-Phase Current.**—(See Appendix—*Current, Simple or Two-Phase Alternating.*)

**Simple-Magnetic Shell.**—(See Appendix—*Shell, Simple-Magnetic.*)

**Single-Current Telegraphic Working.**—(See Appendix—*Working, Single-Current, Telegraphic.*)

**Single Curve Pull-Off.**—(See Appendix—*Pull-Off, Single Curve.*)

**Single-Liquid Voltaic Cell.**—(See *Cell, Voltaic, Single-Fluid.*)

**Single-Phase Motor.**—(See Appendix—*Motor, Single-Phase.*)

**Single-Pole Cut-Out.**—(See Appendix—*Cut-Out, Single-Pole.*)

**Single-Wire System for Electric Light Leads.**—(See Appendix—*Leads, Single-Wire System for Electric Light.*)

**Sinusoidal Current.**—(See Appendix—*Current, Sinusoidal.*)

**Six-Pole Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Six-Pole.*)

**Six-Wire System.**—(See Appendix—*System, Six-Wire.*)

**Skew Adjustment of Carbons in Arc Lamp.**—(See Appendix—*Carbons, Skew Adjustment of, in Arc Lamp.*)

**Skin Currents.**—(See Appendix—*Currents, Skin.*)

**Sliding Joint.**—(See Appendix—*Joint, Sliding.*)

**Slinging Wires.**—(See Appendix—*Wires, Slinging.*)

**Slipping of Belt.**—(See Appendix—*Belt, Slipping of.*)

**Smashing Point of Incandescent Electric Lamps.**—(See Appendix—*Point, Smashing, of Incandescent Electric Lamps.*)

**Snapper Sounder.**—(See Appendix—*Sounder, Snapper.*)

**Socket Base.**—(See Appendix—*Base, Socket.*)

**Socket, Pendant** — —An attachment to a socket provided with a chain or chains for turning on or off a lamp not readily accessible.

**Socket, Regulating** — —A lamp socket fitted with an adjustment under control of a key or switch for regulating the degree of incandescence of the filament.

**Socket, Temporary** — —A simple and unfinished form of socket for holding a lamp temporarily.

**Solenoid, Anomalous** — —A term sometimes applied to a solenoid with consequent poles. (See *Solenoid, Practical.*)

**Solution, Amalgamating** — —A solution of mercury employed for readily amalgamating the zincs of a voltaic battery.

Maycock gives the following as a good amalgamating solution:

Two pounds mercury.

Five pounds nitric acid.

Ten pounds hydrochloric acid.

The mercury and nitric acid are mixed together,



and, after the mercury is dissolved, the 20 pounds of hydrochloric acid are added.

To use this liquid the zincs are first cleansed and then dipped into the solution and afterwards rinsed with clean water.

**Sonometer.**—A monochord. (See Appendix—*A Monochord*.)

**Sonometer Interrupter.**—(See Appendix—*Interrupter, Sonometer*.)

**Sorter, Electro-Magnetic** — —An electro-magnetic separator, sometimes applied to a magnetic separator. (See Appendix—*Separator, Electro-Magnetic*.)

**Sounder Push.**—(See Appendix—*Push, Sounder*.)

**Sounder, Snapper** — —A sounder for producing the sounds corresponding to the Morse characters, as they are heard on a sounder, in which the audible signals are produced by the flexure of a spring.

A sounder snapper consists essentially of a dented spring plate firmly connected at one end and the other end moved to-and-fro by hand.

It is used to produce sounds similar to those of the regular electro-magnetic sounder, only, instead of being operated by an electric current, it is operated solely by hand.

**Sounder, Telegraphic Box** — —A sounder, the receiving magnets of which are enclosed in a hollow box for the purpose of increasing the intensity of the sound by means of resonance.

**Sounds, Radiophonic** — —Sounds resulting from the direct action of radiation on certain bodies. (See *Sonorescence*.)

It is the photophonic sounds, produced in the receiving instrument of a photophone, that are employed for the transmission of speech or other intelligence. (See *Photophone*.)

Mercadier gives the following conclusions as the result of his experiments on radiophonic sounds:

(1.) "The radiophone (radiophonic sound) does not appear to be an effect produced by the mass of the receiving plate vibrating transversely, like an ordinary vibrating plate. The nature of the molecules of the receiver and their mode of aggregation do not appear to exercise a predominant influence on the production of sounds.

"The radiophonic phenomena appear principally from an action exercised on the surface of the receiver, and are amplified. The surface is covered with substances black, platinum-black, and the like.

(2.) "Radiophonic sounds result from the action of radiations on the receivers. Radiophonic sounds are produced principally by the action of radiations of great length of wave, called 'C'.

(3.) "The medium in which radiophonic vibration is produced is the layer of coating on the surface of the receivers. This is particularly when the surfaces are covered with a substance absorbing heat, namely heated and cooled by intermissions, with the result that periodic dilatations and contractions are set up, vibratory movement communicated to adjacent gaseous layers, which also vibrate under the same influence.

(4.) "Radiophonic sounds cannot be produced unless the medium which surrounds the surfaces is gaseous. A liquid or solid cannot produce them; but a gaseous medium containing vapor, particularly vapor of ammonia or ether, develops them in a special way: those vapors which have the greatest absorbing thermic power give out the greatest effects."

**Source, Magnetic** — —Any arrangement of parts capable of producing lines of magnetic force.

A permanent magnet, an electro-magnetic circuit through which an electric current is passing, may act as a magnetic source.

**Spark Chronograph.**—(See Appendix—*Chronograph, Spark*.)

**Spark Discharge.**—(See Appendix—*Discharge, Spark*.)

**Spark, Electric** — —The light produced by a disruptive discharge in a space or gap through which the electric current passes.

**Spark, Negative** — —A spark produced by the discharge of a negatively charged conductor.

**Spark, Positive** — —A spark produced by the disruptive discharge of a positively charged conductor.



**Sparkling Terminals.**—(See Appendix—*Terminals, Sparking.*)

**Speaking Telegraph.**—(See Appendix—*Telegraph, Speaking.*)

**Speaking-Tube Annunciator.**—(See Appendix—*Annunciator, Speaking-Tube.*)

**Specific Conductance.**—(See Appendix—*Conductance, Specific.*)

**Specific Dielectric Capacity.**—(See Appendix—*Capacity, Specific Dielectric.*)

**Specific Energy.**—(See Appendix—*Energy, Specific.*)

**Specific Inductance.**—(See Appendix—*Inductance, Specific.*)

**Specific Magnetic Resistance.**—(See Appendix—*Resistance, Specific Magnetic.*)

**Specific Magnetism.**—(See Appendix—*Magnetism, Specific.*)

**Spectro-Photometer.**—(See Appendix—*Photometer, Spectro.*)

**Spectrum, Magnetic** — —A term sometimes employed in place of magnetic figure or magnetic field.

The term magnetic spectrum is unfortunate since magnetic figures so produced can hardly be regarded as spectra, but merely as collections of iron filings arranged in the order which the lines of magnetic force take in the space or atmosphere outside the magnet.

**Speed, Inductance** — —A term proposed for the product of a coefficient of self-induction by an angular velocity.

**Speeding of Machine.**—(See Appendix—*Machine, Speeding of.*)

**Spiral.**—A term sometimes employed in electricity and magnetism in place of an open coil. (See *Coil, Electric.*)

**Spiral, Anomalous** — —A term sometimes employed in place of an anomalous helix or solenoid. (See Appendix—*Solenoid, Anomalous.*)

**Spiral, Left-Handed** — —A term sometimes employed in place of left-handed solenoid. (See *Solenoid, Left-Handed. Solenoid, Practical.*)

**Spiral, Magnetic** — —A term some-

times employed in place of magnetic helix. (See *Coil, Electric.*)

**Spiral, Magnetizing** — —A term sometimes employed in place of a magnetizing helix or coil. (See *Coil, Electric.*)

**Spiral, Primary, of Induction Coil** — —A term sometimes employed for the primary of an induction coil. (See *Coil, Induction.*)

**Spiral, Right-Handed** — —A term sometimes employed in place of right-handed solenoid. (See *Solenoid, Right-Handed. Solenoid, Practical.*)

**Spiral, Secondary, of Induction Coil** — —A term sometimes employed for the secondary of an induction coil. (See *Coil, Induction.*)

**Spontaneous Electricity.**—(See Appendix—*Electricity, Spontaneous.*)

**Spools, Field, of Dynamo-Electric Machine** — —A term sometimes employed for the forms on which the field coils are wound.

**Spring Relay Contact.**—(See Appendix—*Contact, Spring Relay.*)

**Spring Voltmeter.** — (See Appendix—*Voltmeter, Spring.*)

**Standard Clock.**—(See Appendix—*Clock, Standard.*)

**Standard Trolley Switch.**—(See Appendix—*Switch, Standard Trolley.*)

**Standards.**—Telegraphic or telephonic supports placed on the roof of a building for the purpose of supporting telegraphic or telephonic wires or conductors.

**Standards, Dynamo** — —A term applied to the supports for the bearings of a dynamo.

**Starting Box of Shunt-Wound Motor.**—(See Appendix—*Box, Starting, of Shunt-Wound Motor.*)

**Starting Current of Motor.**—(See Appendix—*Current, Starting, of Motor.*)

**Starting Torque of Motor.**—(See Appendix—*Torque, Starting, of Motor.*)

**Static Transformer.**—See Appendix—*Transformer, Static.*)

**Station, Repeating Telegraphic — —**

A station situated at some intermediate point on a long telegraphic line where the currents from the sending station are passed through a relay by means of which they are sent on to the next station by means of a current from a local battery.

**Station, Translating Telegraphic — —**

—A receiving station.

The station at which the signals are received.

**Stay-Eye Clips.**—(See Appendix—*Clips, Stay-Eye.*)

**Steeling, Electro** — —The art of covering copper electros with hardened iron.

**Steel-Yard Ammeter.**—(See Appendix—*Ammeter, Steel-Yard.*)

**Steeps.**—A word sometimes employed in electro-plating for dips or dipping liquids or solutions.

**Steno-Telegraphy.**—(See Appendix—*Telegraphy, Steno.*)

**Stereotype, Electro** — —A word sometimes employed for electrotype.

The term electrotype would appear to be preferable.

**Sticking of Magnetic Armature.**—(See Appendix—*Armature, Magnetic Sticking of.*)

**Stimulation, Unipolar, of a Nerve** — —  
—The stimulation of a nerve produced by the application of a single electrode to the nerve.

This term was proposed by Du Bois Reymond, and is sometimes employed in electro-therapeutics. According to Reymond unipolar stimulation of a nerve is due to the action of the to-and-fro motions of the electric current between the free ends of the open induction circuit at the moment of induction.

**Stimulus, Electrical, of Nerve** — —  
The effect which electricity produces by its passage through a nerve.

Landolt and Sterling give the following facts concerning the electric stimulation of a nerve:

The stimulation is more powerful—

(1.) At the moment the current is completed.

(2.) At the moment the current ceases.

(3.) When a constant electric current increases or decreases in its strength. The more rapid the variations, the more energetic the stimulation.

(4.) To stimulate a nerve, the current must have a certain duration.

(5.) The electric current is most active when applied to the longer axis of the nerve, and becomes inactive when applied at right angles to this axis.

(6.) The greater the length of nerve treated by the current, the smaller is the stimulus that is required.

**Stone, Bolognian** — —A term originally applied to a calcareous substance that became phosphorescent on exposure to light.

**Stoneware Dipping Basket.**—(See Appendix—*Basket, Stoneware Dipping.*)

**Stoneware Dipping Bowl.**—(See Appendix—*Bowl, Stoneware Dipping.*)

**Stopping-Off Process.**—(See Appendix—*Process, Stopping-Off.*)

**Stopping-Out Process.**—(See Appendix—*Process, Stopping-Out.*)

**Storage Accumulator.**—(See Appendix—*Accumulator, Storage.*)

**Storage Battery, Formed Plates of** — —  
—(See Appendix—*Plates, Formed, of Storage Cell.*)

**Stove, Plate, Electric** — —A form of electric stove in which the heat is imparted to the plate from a suitably shaped resistance.

A form of plate stove is shown in Fig. 580, a



Fig. 580. Electric Plate Stove.

part of the top being cut away to show the electric heater.

**Strain.**—The deformation produced by the action of a stress.

**Strain, Electrostatic** — —A strain or deformation produced in any medium by

means of the stress caused by an electrostatic field.

**Stranding of Conductor.**—(See Appendix—*Conductor, Stranding of.*)

**Strap Key.**—(See Appendix—*Key, Strap.*)

**Streams, Phantom** — — A term sometimes applied to a variety of the Tesla streaming discharge. (See *Discharge, Streaming.*)

**Striking Distance.**—(See Appendix—*Distance, Striking.*)

**Striking Distance for Various Substances.**—(See Appendix—*Distance, Striking, for Various Substances.*)

**Striking Mechanism of Arc Lamp.**—(See Appendix—*Lamp, Arc, Striking Mechanism of.*)

**Stroboscope.**—An instrument employed in the study of periodic motion.

The stroboscope is based on the illumination at frequent intervals of the body whose motion is to be studied.

**Stroboscopic.**—Of or pertaining to the stroboscope.

**Struck.**—A word employed in electroplating to characterize a surface that has been covered with a film of electro-deposited metal by being placed in a bath and exposed for a few moments to the action of a strong current.

When the surface of the article to be plated has been struck or covered with a thin film of metal, the remainder of the coating is deposited on the surface by the action of a weaker current.

**Successive Contact Key.**—(See Appendix—*Key, Successive Contact.*)

**Surging Circuit.**—(See Appendix—*Circuit, Surging.*)

**Surging, Induced Electric** — — Electrical surgings induced in neighboring conductors by means of electrical surgings or oscillating discharges. (See *Discharge, Oscillating.*)

**Suspension of Compass Needle, Cardan's** — — A term sometimes employed for gimbal suspension. (See *Gimbals.*)

**Sweeping-Out Charge.**—(See Appendix—*Charge, Sweeping-Out.*)

**Swinging Annunciator.**—(See Appendix—*Annunciator, Swinging.*)

**Switch, Automatic Photo-Electric** — — A switch that is automatically opened or closed on the exposure of its face to differences of illumination.

A selenium cell is so placed in a circuit in combination with an electro-magnetic switch that when one of the selenium faces is exposed to the decreasing illumination of approaching night a current is produced by such decrease of light, the direction of which is such as to automatically turn on or light an electric lamp, and conversely, on the approach of daylight and the consequent increase of solar illumination, to turn off the light.

**Switch, D. B.** — — A contraction for double-break switch. (See *Switch, Double-Break.*)

**Switch, D. P.** — — A contraction for double-pole switch. (See *Switch, Double-Pole.*)

**Switch, Flush Key** — — A switch whose mechanism is contained in a box, the face of which is flush with the wall or other support to which the switch is attached.

The switch is opened or closed by means of a key.

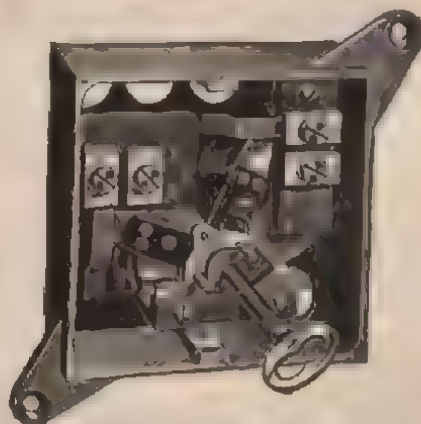


Fig. 581. Flush Key Switch.

A form of flush switch is shown in Fig. 581 in which a removable key, instead of the ordinary, fixed key, is employed for opening and closing the switch.

**Switch, Four-Way** — — A term sometimes employed in place of four-point switch. (See *Switch, Four-Point*.)

**Switch, Jack** — — A term sometimes employed in place of spring-jack. (See *Spring-Jack*.)

**Switch, Left-Hand Trolley** — — In a system of electric street railways a trolley switch designed for use at a point where a branch trolley leaves the main line to the left-hand side in the going direction.

**Switch, Lever** — — Any form of switch in which the circuit is closed or opened by means of the movement of a lever arm.

**Switch, Push** — — A switch included in a push case and operated by means of a push button.

In push switches successive motions of the button make or break the circuit.

**Switch, Quick-Break** — — A switch by means of which a circuit is rapidly or quickly broken.

**Switch, Right-Hand Trolley** — — In a system of electric street railways a switch designed for use at a point where a branch trolley wire leaves the main line to the right in the going direction.

**Switch, Rocking** — — A form of switch operated by means of an electro-magnet by which storage cells are automatically removed from the circuit of the charging dynamo to prevent the battery from discharging through it in case the voltage of the dynamo falls below the E. M. F. of the battery.

**Switch, Standard Trolley** — — In a system of electric railways the device employed to hold together the trolley wires at any point where the wire branches, and for automatically guiding a trolley wheel along the wire over the track taken by the car.

**Switch, T. P.** — — A contraction for Triple-Pole Switch. (See Appendix—*Switch, Triple-Pole*.)

**Switch, Three-Way** — — A term sometimes employed in place of three-point switch. (See *Switch, Three-Point*.)

**Switch, Three-Way Trolley** — — In a system of electric street railways, a trolley switch designed for use at a point where the line branches in three directions.

**Switch, Triple-Pole** — — A switch consisting of a combination of three separate switches for opening or closing the three circuits at the same instant.

**Symmetrical Electrometer**. — (See Appendix—*Electrometer, Symmetrical*.)

**Symphonance**. — A word proposed in place of resonance. (See *Resonance, Electric*.) (See Appendix—*Resonance, Acoustic*.)

**Synchronous-Multiplex Telegraph**. — (See Appendix—*Telegraph, Synchronous-Multiplex*.)

**Synthesis, Electro** — — The combination of electro-positive and electro-negative radicals under the influence of electricity.

**Syringe, Battery** — — A syringe arranged to readily transfer the acid or spent liquids from a voltaic cell or battery for the introduction of fresh liquid.

**System, Delta Tri-Phase** — — A tri-phase system in which the terminal connections resemble in form the Greek letter delta.

**System, Electrically Tuned** — — A term sometimes employed for a circuit or system of circuits that has been brought into electrical resonance with another circuit or system of circuits. (See *Resonance, Electric*.)

**System, Five-Wire** — — A system similar in its arrangements to the three-wire system in which four dynamos are connected to five wires or conductors. (See *System, Three-Wire*.)

In such a case there are three wires or conductors occupying the position corresponding in general to the neutral wire or conductor in a three-wire system.

**System, Four-Wire** — — A system similar in its general arrangement to the three-wire system, in which three dynamos are connected to four wires or conductors. (See *System, Three-Wire*.)

In such a case there are two wires or conductors occupying in general a position correspond-



ing to the neutral wire of the three-wire system. (See *System, Three-Wire*.)

**System, Municipal, of Electric Lighting** — A series system of incandescent lighting invented by Edison for use in cities, particularly for street or window lamps, and operated at a total continuous current pressure of 1,000 volts.

**System, Six-Wire** — A system similar in general to the three-wire system in which five dynamos are connected to six conductors or leads. (See *Appendix—System, Five-Wire*.)

**System, Y Tri-Phase** — A tri-phase system in which the terminal apparatus resembles in form the capital letter Y.

## T

**t.** — A symbol used for time.

**t : m.** — An abbreviation proposed for revolutions per minute, a practical unit of angular velocity.

**T. P. Switch.** — (See *Appendix—Switch, T. P.*)

**Tap Wire in Quadruplex Telegraphy.** — (See *Appendix—Wire, Tap, in Quadruplex Telegraphy*.)

**Tape, Kerite** — A kerite covered insulating tape.

**Tape, Rubber** — Insulating tape made of rubber.

**Tapper Key.** — (See *Appendix—Key, Tapper*.)

**Tapper, Magneto** — A term sometimes employed in place of magneto key. (See *Key, Magneto-Electric*.)

**Tapper, Morse** — A form of telegraphic key provided with two contacts, one in front and the other in the back, arranged so that the depression of the key makes one contact and breaks the other.

**Troth, Pacinotti** — A term sometimes employed in place of Pacinotti projections. (See *Projections, Pacinotti*.)

**Telegram.** — A telegraphic dispatch or communication.

**Literally,** anything written by means of a telegraph.

**Telegraph.** — Any instrument or combination of instruments for conveying a communication or dispatch to a distance by means other than the unassisted voice.

**Telegraph, Aconstic** — A general term embracing the apparatus employed in acoustic telegraphy. (See *Telegraphy, Acoustic*.)

**Telegraph, Automatic** — A general term embracing the apparatus employed in automatic or machine telegraphy. (See *Telegraphy, Automatic*.)

**Telegraph, Chemical** — A general term embracing the apparatus employed in chemical telegraphy. (See *Telegraphy Chemical*.)

**Telegraph, Contraplex** — A general term embracing the apparatus employed in contraplex telegraphy. (See *Telegraphy, Contraplex*.)

**Telegraph, Dial** — A general term embracing the apparatus employed in dial telegraphy. (See *Telegraphy, Dial*.)

**Telegraph, Diplex** — A general term embracing the apparatus employed in diplex telegraphy. (See *Telegraphy, Diplex*.)

**Telegraph, Duplex** — A general term embracing the apparatus employed in duplex telegraphy. (See *Telegraphy, Duplex, Bridge Method of, Telegraphy, Duplex, Differential Method of*.)

**Telegraph, Electric** — An electrical instrument for conveying a communication or dispatch to a distance by means other than the unassisted voice.

Electric telegraphs are of a great variety of forms. They may be divided into classes, either according to the number of dispatches they can simultaneously transmit, or according to the



method employed for transmitting or receiving the dispatches.

According to the number of messages they can transmit simultaneously, telegraphs are divided into duplex, diplex, contraplex, quadruplex, multiplex, phonoplex, harmonic, synchronous-multiplex, etc., etc.

According to the differences in the method of transmitting and receiving the messages, they are divided into the electro-magnetic, the needle, the chemical, the dial, the fac-simile, the writing, the acoustic, the speaking, the induction, the automatic, the fire-alarm, etc., etc.

**Telegraph, Electro-Magnetic** — —A general term embracing the apparatus employed in the various systems of electro-magnetic telegraphy.

**Telegraph, Fac-Simile** — —A general term embracing the apparatus employed in fac-simile telegraphy. (See *Telegraphy, Fac-Simile*.)

**Telegraph, Fire-Alarm** — —A general term embracing the apparatus employed in fire-alarm telegraphy. (See *Telegraphy, Fire-Alarm*.)

**Telegraph, Harmonic** — —A general term embracing the apparatus employed in harmonic telegraphy. (See *Telegraphy, Gray's Harmonic Multiple*.)

**Telegraph, Induction** — —A general term embracing the apparatus employed in induction telegraphy. (See *Telegraphy, Induction*.)

**Telegraph, Multiplex** — —A general term embracing the apparatus employed in multiplex telegraphy. (See *Telegraphy, Multiplex*.)

**Telegraph, Needle** — —A general term embracing the apparatus employed in needle telegraphy. (See *Telegraphy, Needle System of*.)

**Telegraph, Phonoplex** — —A general term embracing the apparatus employed in phonoplex telegraphy. (See *Telegraphy, Phonoplex*.)

**Telegraph, Quadruplex** — —A general term embracing the apparatus employed in quadruplex telegraphy. (See *Telegraphy,*

*Quadruplex, Bridge Method of, Telegraphy, Quadruplex, Differential Method of*.)

**Telegraph, Speaking** — —A general term embracing the apparatus employed in speaking telegraphy. (See *Telegraphy, Speaking, Telephone*.)

**Telegraph, Synchronous-Multiplex** — —A general term embracing the apparatus employed in synchronous-multiplex telegraphy. (See *Telegraphy, Synchronous-Multiplex*.)

**Telegraph, To** — —To write or communicate at a distance by means of the telegraph.

**Telegraph, Writing** — —A general term embracing the apparatus employed in writing telegraphy. (See *Telegraphy, Writing*.)

**Telegraphic Box Sounder**.—(See Appendix—*Sounder, Telegraphic Box*.)

**Telegraphic Interrupter**.—(See Appendix—*Interrupter, Telegraphic*.)

**Telegraphic Interruption**.—(See Appendix—*Interruption, Telegraphic*.)

**Telegraphic Polar Relay**.—(See Appendix—*Relay, Polar, Telegraphic*.)

**Telegraphic Spark Coil**.—(See Appendix—*Coil, Spark, Telegraphic*.)

**Telegraphist**.—One skilled in the art of transmitting intelligence by means of the telegraph.

**Telegraphy, Air** — —A term sometimes employed for induction telegraphy. (See *Telegraphy, Induction*.)

The term air telegraphy has been applied on account of the fact that the electric impulses on one line wire or conductor are transmitted across an air space to a neighboring line wire or conductor, *i. e.*, the air acts as the dielectric through which the induction takes place.

**Telegraphy, Steno** — —A system of telegraphy in which the sounds of a word are represented by characters in place of letters.

Steno-telegraphy differs from ordinary telegraphy in the same manner that shorthand writing differs from longhand writing.

The object of steno-telegraphy is, of course, to insure increased economy in speed.

**Tele-Indicator.**—(See Appendix—*Indicator, Tele.*)

**Tele-Meteorograph.**—A form of meteorograph. (See Appendix—*Meteorograph.*)

**Telephone Indicator.**—(See Appendix—*Indicator, Telephone.*)

**Telephone, Pan** — —A word proposed for a certain sensitive form of telephone.

The particular form of telephone for which the name pan-telephone was proposed was an instrument with a microphone transmitter.

**Telephone, Sensitiveness of** — —The ability of a telephone properly to respond to currents much smaller than those required for the operation of some other telephonic apparatus.

The telephone is characterized by its extreme sensitiveness, requiring, as it does, for its operation a very small current. It is for this reason that the current produced in the telephone circuit by the induction of neighboring conductors causes the annoying cross-talk in the telephone.

**Telephone, Thermo** — —A telephone transmitter consisting of a tense wire, one end of which is connected with the transmitting diaphragm, placed in circuit with a receiving telephone battery, and having a current passing through it of sufficient strength to heat it.

On speaking near the wire the waves in the air periodically cool the wire, and its resistance varies, and accordingly the current in the line varies. A thermo receiver is made in a similar manner, and the telephone current heats the wire periodically and sets the diaphragm in motion.

**Telephone Time Check.**—(See Appendix—*Check, Telephone Time.*)

**Telephonic Meter.**—(See Appendix—*Meter, Telephonic.*)

**Telephonist.**—One skilled in the art of telephony.

**Telephony.**—The art of transmitting intelligence by the use of the telephone. (See *Telephone.*)

**Telephony, Duplex** — —A system of telephony by means of which a single line

wire or conductor can be simultaneously used by two subscribers.

**Telephony, Multiplex** — —A system of telephony by means of which a single line wire or conductor can be simultaneously used by a number of subscribers.

**Tele-radiophone.**—A form of radiophone arranged for the simultaneous transmission of telegraphic and telephonic messages.

**Tele-radiophone, Auto-reversible or Multiple** — —A photophone so arranged that a number of telegraphic communications may be simultaneously sent over a line wire or conductor either all in one direction or part in one direction and the remainder in opposite directions.

The adjectives auto-reversible and multiple refer to the fact that the messages can be transmitted either all in the same direction, or a number in one direction and the remainder in the opposite direction.

A multiple auto-reversible tele-radiophone is an invention of Mercadier's, based on the electrical properties of selenium.

A number of selenium cells of variable resistance are employed at the sending station, where they are placed in the circuit of a battery of a few elements and of a line wire extending to the receiving station, which is connected with a number of receivers equal to the number of selenium cells of variable resistance.

When luminous radiations are intermitted so as to have the relative succession and duration of the characters of the Morse alphabet, and these impulses are sent over the line, they affect the receivers at the other end. Each transmitter sends into the line impulses of a definite rate and only affects that receiving instrument at the other end which is tuned in unison with it. The apparatus is similar in its general action to Gray's system of multiple harmonic telegraphy. (See *Telegraphy, Gray's Harmonic Multiple.*)

**Telpher Locomotive.**—(See Appendix—*Locomotive, Telpher.*)

**Temporary Socket.**—(See Appendix—*Socket, Temporary.*)

**Tenalon, Difference of** — —An objectionable term sometimes employed in place of difference of potential.

This use of the term should be strictly avoided, as it is unnecessary and to a great extent meaningless.

**Terella.**—Literally, a little earth.

A sphere of hardened steel, or, as used by Gilbert, of loadstone, having marked thereon the poles and equator, and so magnetized that the distribution of its magnetism shall resemble the distribution of the earth's magnetism.

**Terminals, Sparking** — —Terminals between which a series of disruptive discharges are passed.

Sparking terminals are generally provided with rounded or blunt or disc-shaped ends so as to prevent a convective discharge from taking place.

**Terrestrial Magnetic Induction.**—(See Appendix—*Induction, Magnetic, Terrestrial.*)

**Tesla Discharge.**—(See Appendix—*Discharge, Tesla.*)

**Tesla Frequencies.**—(See Appendix—*Frequencies, Tesla.*)

**Test, Blavier's** — —A test introduced by Blavier for localizing a single fault in a single telegraphic line or conductor by measuring the resistance at one end of the line when the other end is alternately freed and earthed.

**Test Board.**—(See Appendix—*Board, Test.*)

**Test, Loop** — —A localization test for a single fault in a loop of two telegraphic wires, or in a complete metallic circuit.

**Test, Overlap** — —A localization test for a single fault in a single telegraphic line by observing the resistance from each end and deducing from the amount to which the sum of the resistances overlap the total conductor resistance of the line.

**Tetrad Atom.**—(See Appendix—*Atom, Tetrad.*)

**Theoretical Magnet.**—(See Appendix—*Magnet, Theoretical.*)

**Theory, Contact, of Electricity** — —A theory that ascribes the production of electricity in a voltaic cell, and to some extent

the production of electricity by friction, to the contact of dissimilar substances or surfaces.

The act of contact is assumed to produce a difference of potential. While mere contact may unquestionably produce a difference of potential, it requires the liberation of the chemical potential energy of the metal of the positive plate of a voltaic couple to maintain such differences of potential as to produce a continuous flow of a current.

**Thermancy, Electro** — —A term proposed for that branch of electricity which treats of the effects produced by an electric current on the temperature of a thermo-electric junction.

**Thermo-Chemical Cell.**—(See Appendix—*Cell, Thermo-Chemical.*)

**Thermo Chemistry.**—(See Appendix—*Chemistry, Thermo.*)

**Thermo-Electric Generator.**—(See Appendix—*Generator, Thermo-Electric.*)

**Thermo-Electric Pair.**—(See Appendix—*Pair, Thermo-Electric.*)

**Thermo-Electrometer.** (See Appendix—*Electrometer, Thermo.*)

**Thermo-Multiplier.**—A thermopile.

**Thermo Pair.**—(See Appendix—*Pair, Thermo.*)

**Thermo-Phone.**—An electrical instrument for producing sounds by means of electrically produced heat.

**Thermostatic.** — Of or pertaining to a thermostat.

**Thermo-Telephone.** — (See Appendix—*Telephone, Thermo.*)

**Thermotic, Electro** — —Of or pertaining to heat produced by electricity.

**Thimble Brush.**—(See Appendix—*Brush, Thimble.*)

**Thomson.**—A name proposed for the unit of conductivity.

The term *mho* is to-day generally employed for the unit of conductivity. The plan of employing the names of celebrated deceased electricians is a good one and should not be departed from, no matter how deservedly great the name of the living electrician.

**Thomson's Bridge.**—(See Appendix—*Bridge, Thomson's.*)

**Three-Phase Armature.**—(See Appendix—*Armature, Three-Phase.*)

**Three-Phase Currents.**—(See Appendix—*Currents, Three-Phase.*)

**Three-Phase Generator.**—(See Appendix—*Generator, Three-Phase.*)

**Three-Phase Motor.**—(See Appendix—*Motor, Three-Phase.*)

**Three-Way Switch.**—(See Appendix—*Switch, Three-Way.*)

**Three-Way Trolley Switch.**—(See Appendix—*Switch, Three-Way Trolley.*)

**Throw, Concentration** — —A term proposed by Squier for the deflection of a magnetic needle by a current produced under certain circumstances by a couple formed of similar plates of iron or other paramagnetic metals when exposed to chemical action while under the influence of a magnetic field.

The concentration throw is a phenomenon marking the reversal of the direction of current produced by a couple of paramagnetic metals when exposed to the action of a magnetic field. Squier has observed in the case of a couple formed of similar plates of iron exposed to the action of nitric acid while in a magnetic field, that under certain conditions the effect of suddenly putting on a magnetic field was to produce a less rapid deflection of the galvanometer in the opposite direction, so that the electrode which was formerly protected, by being the negative plate of the couple, was now the one acted on by becoming the positive plate.

It is the above phenomenon for which Squier proposes the term of concentration throw.

According to Squier, "The 'protective throw' is due to the actual attraction of the magnet for the iron, and is always in the direction to protect the more strongly magnetized parts, while the 'concentrated throw' is always in the opposite direction, and depends upon the distribution of the iron salts present in the solution, and the convection currents in the liquid. The concentration of the products of the reaction about the point, would tend to produce a ferrous reaction instead of a ferric reaction, and experiments show that a

higher electromotive force is obtained with cells in which a ferrous reaction takes place than with those in which a ferric reaction occurs, and this change in the character of the reaction produced by the concentration probably accounts, at least in part, for the increased electromotive force at the point."

**Throw, Protective** — —A term proposed for the protection afforded by a magnetic field to paramagnetic metals exposed to chemical action.

When two similar electrodes of iron, or other paramagnetic metals, are exposed to chemical action while under the influence of a strong magnetic field, they act as a voltaic couple and the direction of the current produced depends on the direction of the lines of magnetic force. In the case of iron exposed to the action of nitric acid, one electrode being in the shape of a pointed cylinder and the other in the shape of a disc, when the lines of magnetic force of the field coincide in the direction with the length of the disc, the current produced passes through the liquid from the disc to the electrode, that is, from the less magnetized electrode, to the more magnetized electrode, the presence of the magnetic field determining the direction of the current produced. In this, as in all similar cases of voltaic couples, the negative plate or electrode is protected from the chemical action, the positive plate alone being acted on.

The name protective throw is proposed by Squier for the protection so afforded, who has studied the phenomena. The proposed term would appear to be an unfortunate one, the protection not being afforded by the throw of the needle.

**Tint-Electro.**—A term proposed for a method of electric engraving.

**Tip, Conducting Cord** — —A blunted or rounded conductor placed at one of the ends of a wire for the purpose of readily inserting it into a binding post or into a hole in a plate.

**Tip, Conducting Cord, Separable** — —A cord and tip arranged so that the tip is readily detachable from the cord.

The method of attachment can be insured in a variety of ways. A screw thread forms one of the most obvious.



**Tonicity, Electric** — —A term sometimes employed for electrotonus. (See *Electrotonus*.)

**Tool, Electric Machine** — —A machine tool of any character driven directly by electric power.

In electric machine tools the motor is generally so placed that the moving power is thus connected directly to the machine instead of transmitted to it by means of belting. Among the many advantages possessed by electric machine tools is that such tools do away entirely with lines of shafting.

**Top-Hat Curve.**—(See Appendix—*Curve, Top-Hat*.)

**Torque, Running, of Motor** — —The torque exerted by a motor while running.

**Torque, Starting, of Motor** — —The torque exerted by a motor at the moment of starting.

The starting torque in a well-constructed motor, either of the alternating or continuous type, is always in excess of the torque it exerts at full load.

**Total Contact.**—(See Appendix—*Contact, Total*.)

**Total Intensity of Earth's Magnetism.**—(See Appendix—*Magnetism, Total Intensity of Earth's*.)

**Touch, Divided** — —A term sometimes employed in place of separate touch. (See *Touch, Separate*.)

**Tourniquet, Electric** — —A term sometimes employed in place of electric flyer. (See *Flyer, Electric*.)

**Transference, Convection** — —The transference of electricity in a liquid substance unattended by chemical changes in the liquid.

Convection transference of electricity appears to partake of the nature of atomic convection, the charge being carried by each atom or group of atoms in the direction in which the electricity is being transferred.

**Transform.**—To change or convert.

To convert or change the electromotive force and consequently simultaneously to change the current strength of the circuit by any means.

Strictly speaking, a transformer is regarded as changing the electromotive force. It therefore produces at the same time changes in the value of the current strength. When we speak of a step-down transformer we refer to a transformer which lowers or decreases the value of the electromotive force, although, of course, at the same time, it is employed to raise or increase the strength of the current.

**Transformation.**—The act of transforming or changing.

**Transformation, as of Electromotive Force** — —A change in the value of the electromotive force by means of an induction coil or transformer. (See *Transformer*.)

Electric power is equal to the product of the current by the electromotive force. By the use of a transformer the electromotive force, and consequently the current strength, are changed or altered in value. Since in a well-constructed transformer but very little energy is lost in transformation, the product of  $C$   $E$ , in the primary very nearly equals the product of  $C'$   $E'$ , in the secondary. It follows, therefore, that as the electromotive force increases in the secondary, the current strength decreases and *vice versa*.

In the case of a transformer the transformation is directly proportional to the ratio of the number of turns of the primary and the secondary circuits.

**Transformation, Current** — —The act of changing the value of the current in any circuit by changes effected in its electromotive force. (See *Transformer*.)

The act of changing the character of the current, such, for example, as a direct into an alternating current or the reverse, or a single alternating current of short wave length and high frequency into triphase or polyphase currents.

It will be observed that the term current transformation is employed in two distinct senses.

**Transformation of Electric Force.**—(See Appendix—*Force, Electric, Transformation of*.)

**Transformation, Ratio of** — —The ratio between the electromotive force produced in the secondary of an induction coil or transformer and the electromotive force impressed on the primary.



The ratio of transformation depends on the relative number of turns of the secondary and primary coils of the transformer. In a well-constructed transformer there is very little energy lost in producing a transformation by means of mutual induction. Consequently the energy produced in the secondary must very nearly equal the energy that has been expended in the primary. Suppose, for example, that the number of turns of the secondary of an induction coil is one-fiftieth that of the primary; then the difference of potential induced in the secondary will be but one fiftieth that impressed on the primary. In order to make the product of the current strength and the difference of potential in the secondary equal to the product of the current strength and difference of potential in the primary, the current strength in the secondary will have to be fifty times greater than the current strength in the primary; or, in other words, the product of  $C$  and  $E$ , in the primary will very nearly equal the product of  $C'$  and  $E'$  in the secondary, *i. e.*,  $C E = C' E'$  nearly, assuming their lag factors to be equal.

**Transformer, Alternating-Current Rotary** — — A term sometimes employed for an alternating current motor which at the same time, by means of a suitable commutator, delivers continuous currents on a separate circuit.

**Transformer, Closed-Circuit** — — A term sometimes employed for closed-iron-circuit transformer. (See *Transformer, Closed Iron Circuit*.)

**Transformer, Continuous Current** — — A term sometimes used for motor-dynamo or dynamotor. (See *Transformer, Constant Current*.)

**Transformer, Direct-Current Rotary** — — A term sometimes employed for a motor-generator. (See *Generator, Motor*.)

**Transformer, High-Frequency** — — A transformer in which the frequency of the currents employed is high.

**Transformer, Iron-Loss in** — — A loss of energy in a transformer due to magnetic hysteresis or molecular magnetic friction and to the setting up of eddy or Foucault currents in the iron.

According to Steinmetz, there is no sensible magnetic viscosity in a transformer up to 204.5 complete periods per second. If the eddy or Foucault currents are excluded, the hysteresis loss of a transformer can, up to 200 complete periods per second, be exactly predetermined by calculations based on tests at slow cycles, magnetic viscosity being absent.

**Transformer, Low-Frequency** — — A transformer in which the frequency of the currents employed is low.

**Transformer, Non-Polar** — — A term sometimes employed in place of closed-iron-circuit transformer. (See *Transformer, Closed Iron Circuit*.)

**Transformer, Open-Circuit** — — A term frequently employed for open-iron-circuit transformer. (See *Transformer, Open Iron Circuit*.)

A variety of open-circuit transformer is shown in Fig. 58a.

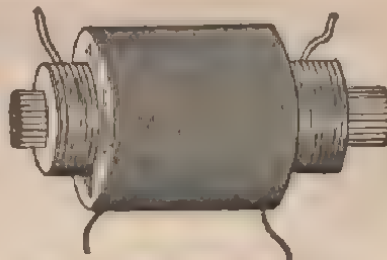


Fig. 58a. Open-Circuited Transformer.

**Transformer, Polar** — — A term sometimes employed for open-circuit transformer. (See Appendix—*Transformer, Open-Circuit*.)

**Transformer, Rotary** — — A term generally employed for the combination of a motor and generator in one machine, *i. e.*, one armature and one motor.

Sometimes employed in place of a continuous current transformer. (See *Transformer, Constant Current*.)

The rotary transformer is employed either to transform continuous currents into continuous currents of different potential, in which case its armature contains two windings, the generator

winding and the motor winding, and the ratio of transformation is equal to the ratio of the turns of the two windings; or for converting alternate or polyphase currents into continuous currents, in which case if the maximum alternate current potential equals the continuous current potential, it generally contains one armature winding only, which is connected to the continuous current commutator, and at two, three or four equidistant points to collector rings.

Such rotary transformers are used extensively in long-distance power transmission for converting the alternating or polyphase currents into continuous currents for railway circuits, or for supplying alternating current circuits, or for electric welding.

The term rotary transformer should not be confounded with rotary current transformer. (See *Transformer, Rotary Current*.)

**Transformer, Static** — A term sometimes employed for an ordinary transformer as distinguished from a rotary transformer. (See Appendix—*Transformer, Rotary*.)

**Transforming**.—Converting or changing the electromotive force and consequently the current strength in any circuit.

**Transition Resistance**.—(See Appendix—*Resistance, Transition*.)

**Translating Telegraphic Station**.—(See Appendix—*Station, Translating Telegraphic*.)

**Translation Lag**.—(See Appendix—*Lag, Translation*.)

**Translation, Manual** — In telegraphy, especially in sub-marine telegraphy, the translation of a message from one circuit directly to another by an operator, who transmits to the second circuit, direct from signals received on the first, without writing down or transcribing the message.

**Transmitter, Automatic Telegraphic** — An apparatus employed in a system of automatic telegraphy for sending or transmitting the prepared messages.

\*The message for automatic telegraphy is prepared by properly punching or perforating a slip or fillet of paper. This fillet is passed through a transmitter so as to transmit automatically.

**Transposition**.—In telephony a term denoting the relative position of two parallel conductors.

Transpositions are made in conductors in order to neutralize the electromotive force produced by neighboring currents.

**Trap, Burglar Alarm** — A device in which a burglar-alarm contact held in an open position by the pull of a string against the action of a spring.

The slightest disturbance of the string draws the contact in one direction; the destruction of the string permits it to draw it in the opposite direction, either case insuring the closing of the circuit and the ringing of an alarm bell.

**Treated Coked Filament**.—(See Appendix—*Filament, Treated Coked*.)

**Tree Insulator**.—(See Appendix—*Insulator, Tree*.)

**Tregadyne**.—A term proposed by Kennelly for a million million dynes, or  $10^{12}$  dynes.

**Treiga**.—A prefix proposed by Kennelly for a million million ergs.

**Tregerg**.—A term proposed by Kennelly for a million million megergs, or  $10^{12}$  ergs.

**Tregohm** — A term proposed by Kennelly for a million million ohms, or  $10^{12}$  ohms.

**Triad Atom**.—(See Appendix—*Triad*.)

**Trico**.—A term proposed by Kennelly for the million millionth part, or  $10^{-12}$ .

**Tricofarad**.—A term proposed by Kennelly for the millionth part of a microfarad, or  $10^{-12}$  farad.

**Trigger, Door** — A device by which notice is given of the opening or closing of a door or window.

**Trigger, One-Way Door** — A trigger which operates on the opening of a door only.

**Trigger, Two-Way Door** — A trigger which operates both when the door is opened and when it is closed.

**Trip, Door, Electric** — —A device for ringing a bell so as to announce the entrance of a customer.

The bell is rung only when the door passes the trip, but does not ring when the door is opened, or when it is being closed.

**Tri-Phase Armature.**—(See Appendix—*Armature, Tri-Phase.*)

**Tri-Phase Current.**—(See Appendix—*Current, Tri-Phase.*)

**Tri-Phase Generator.**—(See Appendix—*Generator, Tri-Phase.*)

**Tri-Phase Motor.**—See Appendix—*Motor, Tri-Phase.*

**Triphased Alternating Currents.**—(See Appendix—*Currents, Triphased, Alternating.*)

**Turtle-Back Electro.**—(See Appendix—*Electro, Turtle-Back.*)

**Two-Phase Alternator.**—(See Appendix—*Alternator, Two-Phase.*)

**Two-Phase Armature.**—(See Appendix—*Armature, Two-Phase.*)

**Two-Phase Generator.**—(See Appendix—*Generator, Two-Phase.*)

**Two-Phase Motor.**—(See Appendix—*Motor, Two-Phase.*)

**Two-Pole Dynamo-Electric Machine.**—(See Appendix—*Machine, Dynamo-Electric, Two-Pole.*)

**Two-Thousand Candle-Power Arc, Definition for** — —(See Appendix—*Arc, Two-Thousand Candle-Power, Proposed Definition for.*)

**Two-Way Door Trigger.**—(See Appendix—*Trigger, Two-Way, Door.*)

**Triple-Pole Switch.**—(See Appendix—*Switch, Triple-Pole.*)

**Tri-Polar Indicator.**—(See Appendix—*Indicator, Tri-Polar.*)

**Trolley Base Frame.**—(See Appendix—*Frame, Trolley Base.*)

**Trough, Plating** — —A term sometimes employed in place of plating bath. (See *Bath, Electro-Plating.*)

**Tube, Lightning** — —A fulgurite. (See *Fulgurite.*)

**Tabular Current.**—(See Appendix—*Current, Tabular.*)

**Tuning of Electrical Circuit.**—Altering the period of a circuit or varying the capacity or self-induction of the circuit so as to bring it into resonance with another circuit.

## U

**Uni-Phase Armature Winding.**—(See Appendix—*Winding, Uni-Phase Armature.*)

**Uni-Phase Motor.**—(See Appendix—*Motor, Uni-Phase.*)

**Unipolar Stimulation of Nerve.**—(See Appendix—*Stimulation, Unipolar, of a Nerve.*)

**Unit, C. G. S., of Volumetric Energy** — —(See Appendix—*Energy, Volumetric, C. G. S. Unit of.*)

**Unlighted Segment of Aurora.**—(See Appendix—*Segment, Unlighted, of Aurora.*)

**Unmarked Magnetic Pole.**—(See Appendix—*Pole, Magnetic, Unmarked.*)

**Unsymmetrical Polyphase Motor.**—(See Appendix—*Motor, Polyphase, Unsymmetrical.*)

**Upper Harmonics of Current.**—(See Appendix—*Current, Upper Harmonics of.*)

## V

**V.**—A symbol used for volt or for volume.

The defining equation is  $V = L \times L \times L$ .

The same symbol is also employed for volt.

**v.**—A symbol used for velocity.

The defining equation is  $v = \frac{L}{T}$ .

The same letter is proposed as a symbol for volt. Its use should be limited to one or the other quantity.

**v.**—A symbol for the ratio between the units of resistance in the electrostatic and electromagnetic C. G. S. system of measurement; *i. e.*, for velocity ratio. (See *Ratio, Velocity*.)

**Vacuum-Tube Lighting.**—(See Appendix—*Lighting, Vacuum-Tube*.)

**Variable Period of Telegraph Line.**—(See Appendix—*Period, Variable, of Telegraph Line*.)

**Variation Magnetometer.**—(See Appendix—*Magnetometer, Variation*.)

**Vector Potential.**—(See Appendix—*Potential, Vector*.)

**Verdet's Constant.**—(See Appendix—*Constant, Verdet's*.)

**Vertical Intensity of Earth's Magnetism.**—(See Appendix—*Magnetism, Vertical Intensity of Earth's*.)

**Vertical Magnetic Needle.**—(See Appendix—*Needle, Vertical Magnetic*.)

**Vibration Frequency.**—(See Appendix—*Frequency, Vibration*.)

**Vibrator.**—An electromagnetic device provided on a siphon recorder for maintaining the siphon in continual vibration so that ink is thrown down upon the fillet of paper beneath.

**Virtual Current.**—(See Appendix—*Current, Virtual*.)

**Visual Telegraphic Signal.**—(See Appendix—*Signal, Telegraphic, Visual*.)

**Volatilization of Electric Conductor.**—(See Appendix—*Conductor, Electric, Utilization of*.)

**Volt, International.**—The value of the international volt adopted by the Chicago Congress of 1893 as equal to such an electromotive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampère, and which is represented sufficiently well for practical use by the electromotive force between the electrodes of the voltaic cell known as Clark's cell, at a temperature of 15° C., and prepared in accordance with certain specifications.

**Volt, Proposed A. I. E. E. Definition.**—The product of the A. I. E. E. ampère by the A. I. E. E. ohm.

**Volt-Ammeter.**—A term proposed for an electric instrument capable of measuring either the volts or the ampères in a circuit both.

A measurer of the volt-ampères or watts.

A wattmeter.

The word wattmeter would appear to be preferable.

**Volta-Electric.**—Of or pertaining to voltaic electricity. (See *Electricity, Voltaic*.)

**Volta-Electricity.**—Voltaic electricity. (See *Electricity, Voltaic*.)

**Volta-Electrometer.**—A voltmeter; *Voltmeter*.)

**Volta-Electrometric.**—Producing voltaic electricity. (See *Electricity, Voltaic*.)

**Volta-Electromotive Force.**—(See Appendix—*Force, Volta-Electromotive*.)

**Volta-Plast.**—A word proposed for a voltaic battery employed in electrotyping.

The use of this word would appear to be entirely unnecessary. There is nothing new about this employment of the voltaic battery.



**Volta-Type.**—A word proposed for electrotype.

The use of this word would appear to be entirely unnecessary. The word electrotype is preferable.

**Voltagraphy.**—Electrotypy.

The word electrotypy would appear to be far preferable.

**Voltaic Battery, Element of** — (See Appendix—*Element of Voltaic Battery.*)

**Voltaic Bow.**—(See Appendix—*Bow, Voltaic.*)

**Voltaic Cell, Callan** — (See Appendix—*Cell, Voltaic, Callan.*)

**Voltaic Cell, Maynooth** — (See Appendix—*Cell, Voltaic, Maynooth.*)

**Voltaic Electromotive Force.**—(See Appendix—*Force, Electromotive, Voltaic.*)

**Voltaic Endosmose.**—(See Appendix—*Endosmose, Voltaic.*)

**Voltaic Heat Cell.**—(See Appendix—*Cell, Voltaic Heat.*)

**Voltaic Magnet.**—(See Appendix—*Magnet, Voltaic.*)

**Voltaic Pair.**—(See Appendix—*Pair, Voltaic.*)

**Voltalism.**—A word sometimes employed in electro-therapeutics for treatment by means of the voltaic current.

The production of electricity by means of voltaic couples.

The latter use of this word was the meaning given to it by Sturgeon in 1842, who defined it as follows: "The production of electricity by the association of metals and other organic bodies by the simple contact of inorganic bodies."

**Voltmeter, Electrometer** — —A voltmeter in which the difference of potential to be measured charges insulated conductors, the electrostatic attractions and repulsions of which produce a deflection of a suitably suspended metallic needle.

A term frequently employed for voltmeter. (See *Electrometer, Voltmeter.*)

**Voltmeter, Galvanometer** — —Any form of galvanometer so arranged as to readily measure difference of potential.

A term sometimes employed for a galvanometer.

Galvanometer-voltmeters may be constructed in a great variety of forms.

In all such cases, however, the difference of potential is measured by the deflection of a needle of a galvanometer by means of the magnetic field produced by the current which flows through a conductor connecting the two points whose difference of potential is to be measured.

In any galvanometer-voltmeter a magnetic field produced, as above described, by the difference of potential which is to be measured, may deflect a magnetic needle against the following forces, namely:

- (1.) Against a magnetic field. (See Appendix—*Voltmeter, Magnetic.*)
- (2.) Against the action of a spring. (See Appendix—*Voltmeter, Spring.*)
- (3.) Against the action of gravity acting on a weight. (See Appendix—*Voltmeter, Weight.*)

**Voltmeter, Magnetic** — —An instrument in which the magnetic field of a current, which is proportional to the difference of potential to be measured, deflects a movable needle against the action of the field of a magnet. (See *Voltmeter.*)

**Voltmeter, Spring** — —An instrument in which the magnetic field of a current, which is proportional to the difference of potential to be measured, deflects a movable needle against the action of a spring. (See *Voltmeter.*)

**Voltmeter, Weight** — —An instrument in which the magnetic field of a current, which is proportional to the difference of potential to be measured, deflects a movable needle against the action of a weight. (See *Voltmeter.*)

**Volume Density of Charge.**—(See Appendix—*Charge, Volume Density of.*)

**Volumetric Energy.**—(See Appendix—*Energy, Volumetric.*)

## W

**W.**—A contraction used for the physical quantity energy, whether it be electrical, thermal, mechanical or chemical, or, in general, to represent the product of the force by the distance.

**W.**—A symbol used for electric energy.

The defining equation is  $W = C E T$ .

The same letter is proposed as the symbol for work and moment of a couple.

**W.**—A symbol proposed for the moment of a couple.

This letter is also employed as the symbol for work.

The defining equation is  $F \times D$ .

**w. h.**—An abbreviation proposed for watt-hour, the practical unit of electric energy.

**Wand, Electric** — — A term sometimes used for an electrophorus in the form of a torch.

An electric wand is employed for gas lighting by a spark produced by means of a small static machine in the handle upon the electrophorus.

**Watchman's Electric Clock.**—(See Appendix—*Clock, Electric, Watchman's.*)

**Water-Gramme Degree.**—(See Appendix—*Degree, Water-Gramme.*)

**Watt-Efficiency of Secondary Battery.**—(See Appendix—*Battery, Secondary, Watt-Efficiency of.*)

**Watt, International** — — The value of the international watt, adopted by the Chicago Congress of 1893, is equal to  $10^7$  units of power in the C. G. S. system, and which is the work done at the rate of one joule per second.

**Watt, Proposed A. I. E. E. Definition for** — — The product of the square of the A. I. E. E. ampère and the A. I. E. E. ohm.

**Waves, Hertzian** — — A term sometimes employed for electro-magnetic waves.

Waves in the ether that are produced by oscillatory discharges passing through a circuit or by a magnetic circuit undergoing variations in its

magnetic intensity. (See *Electricity, Hertz's Theory of Electro-Magnetic Radiation, or Waves.*)

**Way Lease.** — (See Appendix — *Lease, Way.*)

**Weber, A. I. E. E. Definition for** — — A name proposed for the practical unit of magnetic flux.

A unit of magnetic flux having the value of one absolute unit or line.

This unit is a modification of that proposed by a Sub-Committee of the American Institute of Electrical Engineers on Provisional Programme for the International Electrical Congress held in Chicago, U. S. A., in 1893, on the occasion of the World's Columbian Exposition.

The term weber was formerly applied to the unit of current; it never, however, came into very extensive use in the United States.

**Wedges Cut-Out.**—(See Appendix—*Cut-Out, Wedge.*)

**Weeding-Out of Harmonics.**—(See Appendix—*Harmonics, Weeding-Out of.*)

**Weeding-Out of Harmonics by Electrical Resonance.**—(See Appendix—*Harmonics, Weeding-Out of, by Electrical Resonance.*)

**Weight Voltmeter.**—(See Appendix—*Voltmeter, Weight.*)

**Wheel, Barker's** — — A term sometimes applied to a Barker revolving contact breaker. (See Appendix—*Breaker, Contact, Barker's Revolving.*)

**Whirl, Contracting Magnetic** — — A magnetic whirl which is decreasing or moving in towards the electro-magnet or circuit which is producing it.

When variations occur in the strength of the magnetism produced by variations in the strength of the current, expanding or contracting whirls are produced around the conductor which move outwards or from the conductor when the strength of the magnetism is increasing, and inwards or towards the conductor when such strength is decreasing. These whirls produce

electro-magnetic waves in the surrounding ether which are called Hertzian electro-magnetic waves. (See *Whirl, Expanding Magnetic Electricity, Hertz's Theory of.*)

**Whirls, Electro-Dynamic** — —A whirling or rotary motion produced in a cloud of copper oxide in a voltameter when traversed by a powerful electric discharge while under the influence of a magnetic field.

The direction of the rotation is opposite to the hands of a watch before a north magnetic pole and in the same direction as the hands of a watch before a south pole.

**Winding, Differential** — —A —ny double winding of the magnet coils such that the two fields produced thereby are opposed to each other.

**Winding, Single-Phase Armature** — —A uni-phase armature winding.—(See Appendix—*Winding, Uni-Phase Armature.*)

**Winding, Uni-Phase Armature** — —The winding of the armature of a motor such as to enable it to be operated by uni-phase currents.

**Windings, Phase** — —The separate windings on the armature of a polyphase motor. (See Appendix—*Motor, Polyphase.*)

**Windmill, Electric** — —A term sometimes employed in place of electric flyer. (See *Flyer, Electric.*)

**Window or Blind Contact**.—(See Appendix—*Contact, Window or Blind.*)

**Wire, Annunciator** — —Insulated wire suitable for use in connection with annunciators, or other similar purposes.

**Wire, Double Bronze** — —A conducting wire furnished with an aluminium-bronze core and a copper-brass envelope.

A double bronze wire possesses great tensile strength, extreme toughness, and a comparatively low electrical resistance.

A No. 11 standard gauge double bronze wire has a breaking strain of 850 pounds and a resistance of 44.3 ohms per mile at 60 degrees Fahr.

Such a wire is so tough that it will stand from eight to ten bends of 180 degrees each in alternate directions through a radius of 5 millimetres.

**Wire, Idle, of Armature** — —A term sometimes employed in place of dead wire. (See *Wire, Dead, of Armature.*)

**Wire, Idle, of Armature of Dynamo** — —A term applied to that part of the wire on the armature of a dynamo-electric machine in which no useful electromotive force is produced.

The dead wire on an armature. (See *Wire, Dead, of Armature.*)

**Wire, Idle, of Armature of Motor** — —A term applied to that part of the wire on the armature of a motor in which the field produced by the driving current never exercises useful action in driving the motor, in so far as no counter electromotive force is generated in it.

**Wire or Conductor, Balancing** — —A term sometimes employed for a neutral wire or conductor of a three-wire system.

**Wire, Tap, in Quadruplex Telegraphy** — —The intermediate wire or conductor, in a system of quadruplex telegraphy, which divides the battery into two unequal parts, called respectively the long end and the short end.

**Wires, Equalizing** — —Two wires or conductors, one of which is employed for connecting the two positive brushes and the other for connecting the two negative brushes of two compounded dynamos when coupled in parallel.

In general, wires or conductors employed for equalizing electrical pressure or difference of potential in two or more circuits.

In the coupling of two compound-wound dynamos, the equalizing wires are connected one to the two positive brushes and the other to the two negative brushes of the coupled machines. By these means the electrical pressure or difference of potential at the terminals of the two dynamos is made equal, and consequently the currents in the two fields are also made equal.

**Wires, Slinging** — —A term sometimes employed in electro-plating for the wires or conductors by which the articles that are to be electro-plated are hung from the kathode in the plating bath.

**Wiring, Concentric** — —Wiring by means of concentric cables. (See Appendix—*Cable, Concentric*.)

**Working Current of Motor**.—See (Appendix—*Current, Working, of Motor*.)

**Working, Direct, of Telegraphic Sounder** — —A term sometimes employed for the method in which a telegraphic sounder is operated by means of the current received from the line wire or conductor from the distant station in contradistinction to the method where the receiving instrument is operated by means of a local battery.

**Working, Double-Current Telegraphic** — —A term sometimes employed for double-current signaling. (See *Signaling, Double-Current*.)

**Working Efficiency of Telegraphic Circuit**.—(See Appendix—*Circuit, Telegraphic, Working Efficiency of*.)

**Working, Polyphase** — —A general term employed to express the actual application of polyphase currents.

In polyphase currents the armature of the motor is provided with separate sets of coils grouped in two's, three's, etc., and put successively into action at suitable periods.

**Working, Single-Current Telegraphic** — —A term sometimes employed for single-current signaling. (See *Signaling, Single-Current*.)

**Writing Telegraph**.—(See Appendix—*Telegraphy, Writing*.)

## Y

**Y Tri-Phase System**.—(See Appendix—*System, Y Tri-Phase*.)

**Yards, Ampère** — —The product of

the current in amperes by the distance in yards through which it passes. (See *Feet, Ampère. Turn, Ampère*.)

## Z

**Zero, Immediate False** — —A term employed in Wheatstone bridge measurements for an observation made to that position of the galvanometer needle as zero, which is assumed, or which tends to be assumed, immediately after the opening of the circuit of the testing current.

**Zinc-Lead Accumulator**.—(See Appendix—*Accumulator, Zinc-Lead*.)

**Zone, Neutral, of Electrically Charged Insulated Conductor** — —That portion of an insulated conductor, charged by electrostatic induction, which lies approximately midway between its positive and negative ends.

**Zone, Neutral, of Magnet** — —A term sometimes employed for equator of magnet. (See *Magnet, Equator of*.)



# APPENDIX B.

## A

**A.**—A symbol for amperes (Partly International usage).

**A. or An.**—A contraction for anode.

**a.**—A symbol proposed for acceleration.

**α.** A symbol for an angle.

**A. B. C. Telegraph Instrument.**—

A step-by-step dial telegraph instrument marked with the letters of the alphabet.

**A. C.**—A contraction for alternating current.

**A. C. C.**—A contraction for anodic closure contraction.

**A. D. C.**—A contraction for anodic duration contraction.

**A. H.**—A contraction for ampere-hour.

**A. H. E.**—A contraction for ampere-hour efficiency.

**A. O. C.**—A contraction for anodic opening contraction.

**A. T.**—A contraction for ampere-turn.

**A. W. G.**—A contraction for American wire gauge.

**Abnormal Dispersion.**—Anomalous dispersion.

**Abnormal Earth-Current.**—A temporary, stronger, and more variable earth current than usual.

**Abnormal Magnetization.**—Magnetization generally in concentric layers of alternate polarity, produced by oscillatory or Leyden-jar discharges. (Obsolete.)

**Abnormal Vapor - Densities.**—Vapor densities whose values do not appear to conform to Avogadro's hypothesis.

**Abreast.**—Connected in multiple or parallel.

**Abcissa.**—The co-ordinate of a point measured along the axis of abscissas.

**Absolute.**—(1) Complete in itself. (2) Not dependent on secondary bases.

**Absolute Block System for Railroads.**—A block system in which one train only is permitted to occupy a given block, or division of the road, at any one time.

**Absolute Calibration.**—The determination of the absolute reading of an electrometer, galvanometer, voltmeter, ammeter, or other instrument.

**Absolute Electro-Dynamometer.**—An electro-dynamometer for the measurement of electric currents in C. G. S. units by reference to the moment of a bifilar suspension and constants derived from the winding of the coils.

**Absolute Electrometer.**—An electrometer in which the value of the electromotive force is directly determined in absolute units from the deflection of its movable index.

**Absolute Expansion.**—The real expansion of a liquid, or the expansion it would have independently of any change in the dimensions of its containing vessel.

**Absolute Galvanometer.**—Any galvanometer whose indications are directly determined in absolute units of current.

**Absolute Inductivity.**—The real inductivity of a medium as distinguished from the ratio of its inductivity to the inductivity of vacuum.

**Absolute Insulation.**—The total insulation of a circuit or conductor without reference to its length.

**Absolute Permittivity.**—The real permittivity of a medium as distinguished from the ratio of its permittivity to the permittivity of vacuum.

**Absolute Photometric Standard.**—A term for a fundamental standard of light employed in photometric measurements, in contradistinction to a secondary standard.

**Absolute Unit of Current.**—(1) A current of such a strength that when passed through a wire one centimetre in length, bent in the form of an arc of a circle one centimetre in radius, will act with a force of a dyne on a magnetic pole of unit strength placed at the centre of the arc.  
(2) A current of 10 amperes.

**Absolute Unit of Electromotive Force.**—(1) The C. G. S. unit of electromotive force. (2) The one-hundred millionth of a volt.

**Absolute Unit of Inductance.**—A length equal to one centimetre. (2) The one billionth ( $10^{-9}$ ) part of a henry.

**Absolute Unit of Induction.**—A term sometimes used for the absolute unit of inductance.

**Absolute Unit of Magnetomotive Force.**—A unit of magnetomotive force equal to  $4\pi$  multiplied by unit current of one turn.

**Absolute Unit of Resistance.**—(1) The one thousand millionth of an ohm. (2) A microhm.

**Absolute Units.**—The centimetre-gramme-second system of units.

**Absolute Vacuum.**—(1) A space from which all traces of residual gas have been removed. (2) A term sometimes loosely applied to a high vacuum.

**Absolute Zero of Temperature.**—(1) The temperature of a substance in which its molecules are absolutely at rest, or possess no kinetic energy. (2) A temperature of approximately  $-273^{\circ}\text{C}$ .

**Absorption.**—The taking in or drinking in of one form of matter by another, such as a gas, a vapor, or a liquid by any substance, usually a solid; or of energy of sound, light, heat or electricity by ordinary matter.

**Absorption Current.**—The current of diminishing strength which flows into a dielectric under electrification, and which is partly capable of being restored during continued discharge.

**Absorption Dynamometer.**—The name given to a dynamometer in which mechanical power is measured and at the same time absorbed, in contradistinction to a transmission dynamometer, in which the power to be measured is all or nearly all transmitted.

**Absorption, Electric.**—The apparent soaking of an electric charge into the glass or other solid dielectric of a Leyden jar or condenser.

**Absorption of Sound.**—Acoustic absorption.

**Absorption Spectrum.**—A spectrum containing gaps or dark spaces due to absorption by some medium which the radiation has traversed.

**Absorptive.**—Possessing the power of absorption.

**Absorptive Power.**—The power possessed

by certain substances of taking in and condensing gases within their pores.

**Acceleration.**—(1) The time-rate of change of velocity. (2) Increase or decrease of velocity.

**Accumulated Electricity.**—Stored electricity, as in a condenser.

**Accumulating Electricity.**—Storing electricity.

**Accumulation of Electricity.**—(1) The collection of an electric charge in a Leyden jar or condenser. (2) The increase in an electric charge by devices called accumulators. (3) The production of a charge by an influence machine. (4) The collection of electric energy by storage batteries or accumulators.

**Accumulator.**—(1) A word sometimes applied to a current accumulator. (2) A Leyden jar or condenser. (3) A secondary or storage battery.

**Accumulator Distribution.**—Distribution of electric energy by means of accumulators.

**Accumulator Traction.**—Car traction in which the motors are driven by storage batteries carried on the car.

**Acetometer.**—(1) A hydrometer graduated for determining the strength of commercial acetic acid or vinegar. (2) An acidometer.

**Acheson Effect.**—The change in the electromotive force of the secondary of a transformer due to changes of temperature in its core.

**Achromatic.**—Free from false coloration.

**Achromatic Lens.**—A lens capable of forming images free from false coloration.

**Achromatic Ocular.**—An achromatic eye-piece.

**Achromatisable.**—Capable of being freed from false coloration.

**Achromatise.**—To free from false coloration.

**Achromatising.**—Freeing from false coloration.

**Acidimeter.**—An acidometer.

**Acidometer.**—A hydrometer for measuring the specific gravity of an acid liquid, and thereby determining its degree of acidity.

**Aclinic.**—(1) Of or pertaining to no magnetic inclination. (2) Devoid of magnetic inclination or dip.

**Aclinic Line.**—(1) A line connecting places on the earth's surface which have no magnetic inclination. (2) The magnetic equator of the earth.

**Acoustic.**—Of or pertaining to sound.

**Acoustic Absorption.**—The absorption by a vibrating body, of the energy of the sound waves produced by another vibrating body.

**Acoustic Interference.**—Interference of sound waves.

**Acoustic Resonance.**—(1) The increase in the intensity of the sound emitted by a sonorous body by means of sympathetic vibrations set up in a co-periodic sounding body. (2) The condition by virtue of which a sonorous body is capable of having sympathetic vibrations produced in it by a neighboring sounding body.

**Acoustic Synchronizer.**—An instrument for indicating the synchronism of two alternating currents or alternators, by an acoustic apparatus in which silence is produced at synchronism.

**Acoustic Telegraph.**—Any telegraph whose signals are appreciated by the ear, as distinguished from a visual telegraph.

**Acoustic Telegraphy.**—Sound telegraphy; or, any system of telegraphy in which the signals are received by sound, in contradistinction to being received visually.

**Acoustic Tetanus.**—Tetanus produced by alternating currents from an induction coil, when its contact piece is vibrating with sufficient rapidity to produce a musical note.

**Actinometer, Electric.**—An apparatus for electrically testing the delicacy of hearing.

**Actinic.**—Of or pertaining to the chemical effect produced by light or other form of radiant energy.

**Actinic Photometer.**—A photometer in which the intensity of light is measured by the amount of chemical decomposition it produces.

**Actinic Ray.**—A ray of light, or other form of radiant energy, possessing the power of producing chemical action.

**Actinism.**—The chemical effects of light.

**Actino-Electricity.**—Electricity produced in crystalline substances by the action of radiant energy.

**Actinograph.**—An apparatus for measuring and recording the intensity of the chemical effects of light.

**Actinography.**—The method of producing records by the chemical effects of light.

**Actinometer.**—(1) An apparatus for measuring the intensity of the chemical effects of light. (2) A pyrheliometer.

**Actinometer, Electric.**—An apparatus for electrically measuring the intensity of the chemically active rays present in any radiation.

**Actinometry.**—The science of measuring the intensity of the chemical effects of radiant energy.

**Action Currents.**—Physiological currents produced in a muscle or nerve during its activity.

**Active Coil or Conductor.**—A coil or conductor carrying an electric current.

**Active Component of Exciting Current.** (1) The active current in an alternating-current circuit as distinguished from the wattless current. (2) In an alternating-current circuit the component of current which is in phase with the E. M. F. (3) In an alternating-current circuit the product of the E. M. F. and the effective or apparent conductance.

**Active Current.**—(1) The working component of a current in an alternating-current circuit as distinguished from the wattless component of current. (2) The component of an alternating-electric current that is in phase with the impressed electromotive force.

**Active Electromotive Force.**—In an alternating-current circuit that component of the impressed electromotive force which is expended in overcoming the ohmic resistance, as distinguished from the component which is expended in overcoming the induced C. E. M. F.

**Active Loop.**—Any single loop in a circuit that is traversed by an electric current.

**Active Mass.**—In electrolysis the quantity of an electrolyte which is disassociated into its ions, and which is, therefore, active in conveying the electrolyzing current.

**Active Material of Storage Cell.**—The substance or substances in a storage or secondary cell, that undergo decomposition while charging or discharging, and which serve to store the electric energy.

**Active Molecules.**—(1) Those molecules in an electrolyte that, during the passage of an electric current, are resolved into their constituent ions and which, therefore, alone affect the molecular conductivity of the electrolyte. (2) The disassociated molecules in an electrolyte.

**Active Plate of Voltaic Cell.**—A name sometimes given to the zinc or other plate of a voltaic or primary cell which is dissolved during action.

**Active Polar Surface of Magnet.**—That



surface of a magnet from which the useful flux emerges, or into which it enters.

**Active Pressure.**—In an alternating-current circuit that component of the impressed pressure which is expended in overcoming the ohmic resistance.

**Active Pressure.**—A term sometimes employed for the pressure that is effective in producing a current, as distinguished from the impressed pressure.

**Active Wire.**—That portion of the wire on the armature of a dynamo or motor that is passed through the inducing magnetic flux as distinguished from the remainder of the wire sometimes called "idle wire," which does not pass through such flux.

**Activity.**—(1) Power. (2) Rate-of-doing-work. (3) The work done per second, in uniform working.

**Actual Caution.**—A caution produced by the agency of a white heat.

**Actual Energy.**—(1) Energy actually employed in doing work, as distinguished from energy that, though possessing the power of doing work, is in the latent or potential state. (2) Kinetic energy.

**Actual Efficiency.**—Commercial efficiency.

**Acute Angle.**—Any angle less than a right angle or 90 degrees.

**Acute-Angled Trolley-Crossing.**—A contact plate suspended at the point of intersection of two trolley wires crossing at an acute angle.

**Acyelic Region.**—(1) A region devoid of cyclosis. (2) A simply connected region.

**Adapter.**—(1) A screw-nozzle fitted to an incandescent electric lamp and provided with a screw-thread to enable it to be readily placed on a gas bracket, or chandelier, in the place of an ordinary gas burner. (2) A device which permits incandescent electric lamps of one manufacture to be readily placed in the socket of a lamp of another manufacture. (3) Apparatus designed to permit the ready use of a continuous electric current employed for incandescent lighting to produce the feeble continuous currents employed in electro-therapeutic work.

**Adherence.**—The quality or property of adhesion.

**Adhesion.**—The mutual attraction which exists between unlike molecules, as distinguished from the attraction of like molecules, or cohesion.

**Adhesion, Electric.**—The adhesion between surfaces due to the attraction of unlike electrostatic charges.

**Adhesion, Magnetic.**—The adhesion between surfaces due to magnetic flux.

**Adhesive Tape.**—A tape covered with insulating material and possessing adhesive properties, employed for covering bared conductors, at joints, or other similar places.

**Adiabatic Expansion.**—The expansion of a gas which neither receives nor gives out heat to the walls of the chamber in which the expansion takes place, as distinguished from isothermal expansion.

**Adiathermancy.**—Opacity to heat.

**Adiathermanic.**—Of or pertaining to adiathermancy.

**Adielectric.**—(1) Not dielectric. (2) A term proposed for substances, not dielectrics, whose electric conductivity at ordinary temperatures decreases as the temperature increases.

**Adjustable Angle Crossing.**—A form of trolley crossing in which the angle of intersection is adjustable.

**Adjustable Condenser.**—A condenser whose capacity can be readily varied within certain limits.

**Adjustable Resistance.**—A resistance whose value can be readily varied within certain limits.

**Adjustable Rheostat.**—An adjustable resistance.

**Adjustable Vacuum Tube.**—A vacuum tube employed for X-ray work whose vacuum can be decreased by the action of heat on a vaporizable substance.

**Adjustable Wire Clip for Trolley Wire.**—A clip, capable of adjustment as to its position, inserted in an insulator and designed for holding a trolley wire in place.

**Adjuster for Lamp Pendant.**—Any device for adjusting or altering the height or position of a pendant lamp.

**Adjusting Cleat.**—Any cleat that is capable of adjustment as to alignment or height.

**Adjustment.**—Any regulation of an apparatus that will enable it properly to perform its functions.

**Adjustment of Relay.**—Such a regulation of a receiving relay as will permit it to readily respond to signals sent over the line.

**Admittance.**—(1) The reciprocal of the impedance in an alternating-current circuit. (2) The apparent conductance of an alternating-current circuit or conductor.

**Advanced Quadrature.**—In an alternat



ing-current circuit the condition of being <sup>(1)</sup> in phase ahead of some particular E. M. F., flux, or current.

**Adynamic System of Currents.**—A system of currents so opposed to each other in direction as to neutralize one another's magnetic effects.

**Aeolotropic.**—Heterogeneous with respect to direction.

**Aeolotropic Medium.**—(1) A medium possessing different properties in different directions. (2) A medium in which equal stresses applied in any direction do not produce equal strains.

**Spinus' Condenser.**—An early form of air condenser.

**Aerial Cable.**—An electric cable suspended in the air.

**Aerial Circuit.**—(1) That portion of a circuit which consists of aerial conductors or lines. (2) A circuit of overhead wire.

**Aerial Conductor.**—An overhead conductor.

**Aerial Line.**—An overhead line.

**Aerial Telephone Cable.**—A suitably supported overhead telephone cable.

**Aerodromic Transportation.**—Transportation by means of a balloon-supported air over a suitable support guide.

**Aerodynamics.**—The science which treats of the forces produced by air in motion.

**Aero-Ferric-Circuit Transformer.**—An open-circuit transformer.

**Aero-Ferric Inductance.**—The inductance possessed by a coil or coils whose magnetic circuit consists partly of air and partly of iron.

**Aero-Ferric Magnetic Circuit.**—A magnetic circuit that is completed partly through air and partly through iron.

**Aerolite.**—A meteorite.

**Aero-Therapeutics.**—Treatment of disease by means of air under pressures other than that of the atmosphere.

**After Currents.**—Electric currents produced in nerve or in muscular tissue, on the cessation of a constant current which has been flowing through it.

**After Glow of Exhausted Bulb.**—A fluorescent glow, observed in an exhausted glass chamber, after its withdrawal from electrostatic influence.

**Age-Coating of Electric Incandescent Lamp Chamber.**—A blackening of the chamber of an electric incandescent lamp due to the deposit thereon, during use, of carbon, or other opaque substance.

**Ageing of Alcohol, Electric.**—Artifi-

cially ageing alcohol by exposing it to the action of electrically generated ozone.

**Ageing of Electric Incandescent Lamp.**—A gradual decrease in the efficiency of an electric incandescent lamp due either to the age coating of its chamber, or to the deterioration of its filament.

**Ageing of Magnet.**—Treating a permanent magnet for the purpose of rendering its magnetic condition more permanent.

**Ageing of Transformer.**—(1) A decrease in the efficiency of a transformer owing to the ageing of its core. (2) Fatigue of transformer.

**Ageing of Transformer Core.**—Increase in the hysteretic coefficient in the iron of a transformer core, during the first few months of its commercial operation, from its continued magnetic reversals at comparatively high temperature.

**Agglomerate Leclanché Coll.**—A form of Leclanché cell which dispenses with the porous cup by employing the carbon and black oxide of manganese formed into a solid mass by pressure.

**Agitator for Plating Vat.**—A device for ensuring a uniformity in the density of the plating solution in a depositing vat, by mechanical stirring.

**Agonal.**—Of or pertaining to an agone.

**Agone.**—(1) A line connecting places on the earth's surface where the magnetic needle points to the true geographical north. (2) The line of no declination.

**Agonic.**—Of or pertaining to an agone.

**Agonic Line.**—(1) A line connecting terrestrial points being no declination or variation. (2) The agone.

**Air Battery.**—A form of voltaic battery whose electromotive force is increased by the direct absorption of oxygen from the air.

**Air Blast for Commutator.**—A jet of air applied to the surface of the commutator of a dynamo-electric machine to prevent destructive flashing.

**Air-Blast Transformer.**—A transformer which is cooled by a blast of air.

**Air Churning.**—The movement of the air that occurs in the vicinity of the armature of a dynamo or motor during rotation resulting in a loss of energy to the machine.

**Air Condenser.**—A condenser in which air is the dielectric.

**Air-Cooled Transformer.**—(1) A transformer which is cooled by the passage through it of convection currents of air set up by its increase of temperature. (2) An air-blast transformer.

**Air-Core Solenoid.**—A solenoid which has no core other than air.

**Air-Core Transformer.**—A transformer which is destitute of a core other than that of air.

**Air-Expansion Lightning Arrester.**—A form of lightning arrester in which the arc, when formed, is blown out by the expansion of a mass of confined air under the influence of the heat of the arc.

**Air Field.**—That portion of a magnetic field in which the magnetic flux passes through air only.

**Air Film of Lamp Chamber.**—A film of condensed air that tends to remain on the walls of an exhausted lamp chamber after the action of the air pump.

**Air Gap.**—In a magnetic circuit, any gap or opening containing air only.

**Air Gap of Commutator.**—The air space between contiguous segments in an air-insulated commutator.

**Air Insulation.**—An insulation obtained by air, or by the action of air.

**Air Leyden.**—An air condenser.

**Air-Line Wire.**—That portion of a circuit which consists of overhead wires, in contradistinction to the portion which passes through underground conduits, or through a submarine cable.

**Air Magnetic Circuit.**—A magnetic circuit in which the flux passes wholly through air.

**Air Path.**—The path a disruptive discharge takes through the air.

**Air Pump.**—A device for removing air or other gas from a containing vessel.

**Air Reluctance.**—The reluctance of that portion of a magnetic circuit which consists of air.

**Air Resistance of Dynamo.**—The mechanical resistance to the rotation of a dynamo due to the surrounding air.

**Air Space.**—(1) The space that exists between the surface of an armature and the polar surface within which it rotates. (2) The space between opposed surfaces of a comb lightning-arrester.

**Air-Space Cut-Out.**—A modified form of paper cut-out in which the disc of paper or mica is replaced by an air-space.

**Air-Space Submarine Cable.**—A multiple-conductor submarine cable, having a core in which an internal air space is provided for separating the conductors.

**Air Telegraphy.**—(1) Aerial telegraphy. (2) Induction telegraphy. (3) Wireless telegraphy.

**Air-Washing of Lamp Filament.**—A deleterious effect produced on the filament of an incandescent electric lamp by the molecular bombardment of the residual gaseous atmosphere of its chamber.

**Alarm, Electric.**—(1) Any automatic electric device by which attention is called to the occurrence of certain events, such as the opening of a door or window, the stepping of a person on a mat or staircase, the rise or fall of temperature beyond a certain predetermined point, etc., by the closing or opening of an electric circuit. (2) A device for calling a person to a telegraphic or telephonic instrument.

**Alarm Point.**—In a system of fire telegraphy, any point from which an alarm is sent out.

**Alarm Wires of Submarine Cable.**—Extra insulated wires imbedded in the fibrous serving of a submarine cable between the sheathing wires and the conductor core, and capable of giving an alarm when their insulation is affected, through injury to the cable, before the working conductor or central core may be injured.

**Aligned Magnetomotive Force.**—The magnetomotive force in a magnetic circuit containing iron, due to the alignment of the molecular magnets of the iron under the influence of the impressed magnetic force or prime flux.

**"Alive."**—(1) A name sometimes given to a live wire or circuit. (2) An active wire or circuit.

**All-Day Efficiency of Transformer.**—The ratio of the energy commercially supplied by a transformer in 24 hours to the energy absorbed by it from the mains during that time.

**All-Night Arc Lamp.**—A double-carbon arc lamp.

**Allotropic.**—Of or pertaining to allotropism.

**Allotropic State.**—A modification of a substance by means of which, without any change in chemical composition, it acquires physical or chemical properties differing from those it ordinarily possesses.

**Allotropism.**—The state or condition resulting from acquiring the allotropic state.

**Allotropy.**—The property of, or capacity for, acquiring the allotropic state.

**Alloy.**—A combination or homogeneous mixture of two or more metallic substances.

**Alloy.**—To form a combination or homogeneous mixture of two or more metallic substances.

**Alphabetic Telegraph.**—(1) A telegraph in which the letters of the message to be sent are spelled out in succession from a list. (2) An A. B. C. telegraph.

**Alteration Theory of Muscular or Nerve Currents.**—A theory which traces the origin of electric currents in the nerves or muscular fibres to an alteration from their original condition.

**Alternate Currents.** Alternating currents.

**Alternating.**—Periodically changing in direction.

**Alternating Arc.**—(1) An alternating-current arc. (2) An arc supplied from an alternating-current circuit.

**Alternating Continuous-Current Commutating Machine.**—A secondary generator for transforming from alternating to continuous currents by the aid of a commutator.

**Alternating-Current Arc.**—A voltaic arc produced by alternating electric currents.

**Alternating-Current Armature-Winding.** An armature winding suitable for the production of alternating currents.

**Alternating-Current Dynamo-Electric Machine.**—A dynamo-electric machine producing alternating currents in its external circuit.

**Alternating-Current Electric Motor.**—A motor driven by alternating electric currents.

**Alternating-Current Electro-Magnet.**—An electro-magnet whose coils are traversed by alternating currents, and which, although constantly reversing in magnetism, yet possesses a continued attraction for its armature.

**Alternating-Current Phase-Meter.**—An apparatus for measuring the difference between the phases of two alternating currents.

**Alternating-Current Potentiometer.**—A potentiometer suitable for measuring the difference of pressure in an alternating-current circuit.

**Alternating-Current Power.**—(1) Electric power supplied through the medium of alternating currents. (2) The product of the effective alternating-current strength, the effective pressure under which that current is supplied, and the power factor. (3) With sinusoidal electromotive forces and currents, the product of the effective current strength,

the effective pressure under which that current is supplied, and the cosine of the phase-difference between the two.

**Alternating-Current Pressure Indicator.**—An alternating-current voltmeter.

**Alternating-Current Regulator.**—(1) A regulator for maintaining constant the pressure of an alternating-current generator. (2) A regulator for controlling the strength of an alternating current.

**Alternating-Current Rotary Transformer.** A rotary transformer for transforming alternating into continuous-currents, or vice-versa.

**Alternating-Current Transmission.**—Transmission of power or energy by means of alternating currents.

**Alternating-Current Rush.**—(1) A term sometimes applied to the first rush or wave of alternating current passing into the primary coil of a transformer at the moment it is connected to the mains. (2) A term sometimes applied to the oscillatory discharge of a condenser.

**Alternating-Current Working.**—Feeding lamps, motors, or other receptive devices by means of alternating currents.

**Alternating Currents.**—(1) Currents which flow alternately in opposite directions. (2) Currents whose directions are periodically reversed.

**Alternating Discharge.**—(1) A discharge which periodically changes its direction. (2) An oscillatory discharge.

**Alternating Dynamo-Electric Machine.**—An alternating-current dynamo-electric machine.

**Alternating Electromotive Forces.**—Electromotive forces whose directions are periodically reversing.

**Alternating Electrostatic Field.**—A field of electrostatic flux whose direction is periodically reversing.

**Alternating Electrostatic Potential.**—An electrostatic potential whose value is periodically changing sign.

**Alternating Influence Machine.**—An electrostatic influence machine which delivers periodically alternating electric discharges or currents.

**Alternating Magnetic Field.**—A magnetic field the direction of whose flux periodically changes.

**Alternating Magnetic Potential.**—A magnetic potential whose value is periodically changing sign.

**Alternating Magnetic Call-Bell.**—A



call-bell operated by the uncommuted currents of a magneto-electric machine.

**Alternating Magneto-Electric Machine.**—A magneto electric generator that produces alternating currents in its external circuit.

**Alternating Potential.**—A potential, whether electrostatic, electric, or magnetic, that is periodically changing in sign.

**Alternating Sparking Distance.** The air space across which an alternating-current disruptive-discharge would pass.

**Alternation.**—(1) A change in direction. (2) A change or reversal in the direction of an electromotive force or current. (3) A single vibration or oscillation as distinguished from a complete cycle or double vibration.

**Alternation of Current.**—A change in the direction of a current.

**Alternations.**—Successive changes in the direction of a current or electro-motive force.

**Alternative Air-Path of Magnetic Flux.**—In a ferric magnetic circuit a field, outside the iron of the circuit, through which a portion of the magnetic flux passes.

**Alternative Path.**—The path or circuit taken by an impulsive discharge through an insulator in preference to a conducting path or circuit, of enormously smaller ohmic resistance, open to the discharge.

**Alternator.**—The name generally given to an alternating-current dynamo or generator.

**Amalgam.**—A combination or mixture of a metal with mercury.

**Amalgam, Electric.**—A substance with which the rubbers of the ordinary frictional electric machine are covered.

**Amalgamate.**—To form into an amalgam.

**Amalgamating.**—Forming into an amalgam.

**Amalgamating Solution.**—A solution of a salt of mercury employed for readily amalgamating the zincs of a voltaic battery.

**Amalgamation.**—The act of forming into an amalgam or effecting the combination of a metal with mercury.

**Amalgamation of Zinc.**—Coating the surface of the zinc of a voltaic cell with mercury.

**Amalgamator, Electric.**—An electrically driven amalgamator for the treatment of gold or silver ores with mercury.

**Amazite.**—The name given to a particular kind of insulating material.

**Amber.**—A resinous substance generally of a transparent yellow color.

**American Morse Code.**—The Morse telegraphic code employed in America, as distinguished from that employed in other parts of the world.

**American System of Telegraphy.**—The Morse system of telegraphy as employed in America.

**American Telegraphic Code.**—The American Morse code of telegraphic signals.

**American Twist Joint.**—A joint between two conducting wires in which each end is twisted around the other.

**American Wire Gauge.**—The name generally given to the Brown and Sharpe wire gauge, in which the largest wire, No. 0000, has a diameter of 0.46, the wire No. 36, 0.005, and all other diameters are in geometrical progression.

**Ammeter.**—Any form of galvanometer which is capable of measuring current strength directly in amperes.

**Ammeter Panel of Switchboard.**—In a central station the panel of the switchboard which carries the principal ammeter or ammeters.

**Ammunition Hoist, Electric.**—An electrically operated hoist employed for raising ammunition to the gun deck or turret of a ship.

**Amorphous.**—Possessing no definite crystalline form.

**Amperage.**—The number of amperes passing in a circuit in a given time.

**Ampere.**—(1) The practical unit of electric current. (2) A rate of flow of electricity transmitting one coulomb per second. (3) The current of electricity which would pass through a circuit whose resistance is one ohm, under an electro-motive force of one volt. (4) A current of such a strength as will deposit 1.118 milligrammes of silver per second from a specifically prepared solution of silver nitrate.

**Ampere-Arc.**—A single conductor, bent in the form of an arc of a circle, and used in an electric balance for measuring current.

**Ampere-Balance.**—A balance form of ammeter which measures currents of a few amperes, or which determines a current strength of one ampere.

**Ampere-Centimetre.**—A proposed unit of magnetic flux equal to the flux pro-



duced by one ampere flowing through a circuit one centimetre in length.

**Ampere-Foot.**—A unit of current strength multiplied by the distance to which said current is carried, employed in calculating the fall of electric pressure in distributing mains. (2) The magnetic flux or flux density developed in a coil.

**Ampere-Hour.**—(1) A unit of electrical quantity equal to the quantity of electricity conveyed by one ampere flowing for one hour. (2) A quantity of electricity equal to 3600 coulombs.

**Ampere-Hour Efficiency of Storage Battery.**—(1) In a cycle of charge and discharge, the ratio between the ampere-hours taken out of a storage battery and the ampere-hours put into it. (2) The quantity efficiency of a storage battery as distinguished from the energy efficiency.

**Ampere-Hour Meter.**—A meter which is capable of measuring an electric supply in ampere-hours.

**Ampere-Hour Output of Storage Battery.** The amount of useful electric quantity produced by a storage battery in ampere-hours.

**Ampere-Meter.**—An ammeter.

**Ampere-Minute.**—A unit of electrical quantity equal to the electric quantity conveyed by one ampere in one minute.

**Ampere-Ring.**—A word sometimes used for ampere-turn.

**Ampere-Second.**—(1) A unit of electric quantity equal to the quantity of electricity conveyed by one ampere flowing for one second. (2) A coulomb.

**Ampere-Stream in Armature.**—The aggregate current in amperes produced by all the conductors on a dynamo armature.

**Ampere-Tap.**—In a system of electric distribution a tap provided in a branch circuit for carrying off a current of one ampere.

**Ampere-Turn.**—A unit of magneto-motive force equal to that produced by one ampere flowing around a single turn of wire.

**Ampere-Volt.**—A word sometimes used for volt-ampere, or watt.

**Ampere-Yard.**—A proposed unit of electric current multiplied by distance through which said current is carried, sometimes employed in calculations.

**Ampere-Winding.**—A word sometimes used for ampere-turn; i.e., a single winding or turn through which one ampere passes.

**Ampere-per-Square-Centimetre.**—A

unit of density of current expressed in amperes-per-square-centimetre of normal cross-section of conductor.

**Ampere-per-Square-Inch.**—A unit of density of current expressed in amperes per-square-inch of area of normal cross-section of conductor.

**Ampere's Rule for Deflection of Needle.**—The north-seeking pole of a magnetic needle is deflected by a current to the left-hand of an observer who is supposed to be swimming in the current while facing the needle.

**Ampere's Theory of Magnetism.**—A theory or hypothesis which ascribes the cause of magnetism to the presence of electric currents in the ultimate particles of a magnet.

**Amperian Currents.**—The electric currents that are assumed, in the Amperian theory of magnetism, to flow in closed circuits around the ultimate particles of a magnet.

**Amphigenic Charge.**—A name proposed for an electric charge, whose surface density varies in sign.

**Amplitude of Galvanometer Swing.**—(1) In a series of ballistic galvanometer deflections, the half sum of the deflection or elongation from zero, on one side of the scale, and the means of the preceding and following elongations on the other side. (2) When referred to radian measure the ratio of the above quantity to the distance of the scale from the mirror.

**Amplitude of Simple-Harmonic Motion.**—The maximum cyclic value of a simple-harmonic or simple-periodic vibration; or, the distance in a straight line from the median position to the position of greatest elongation.

**Amplitude of Vibration or Wave.**—The extent of the excursion of a simply vibrating particle on either side of its vibrating point or point of rest.

**Amyl-Acetate Standard.**—(1) A photometric standard lamp of definite dimensions burning amyl-acetate. (2) The Hefner-Alteneck standard lamp.

**Amyloid.**—(1) A substance employed in the manufacture of incandescent lamp filaments produced by the action of sulphuric acid on cellulose. (2) Parchmentized cellulose.

**Amyloid Filament.**—An incandescent lamp filament made from amyloid.

**Anæmic Cataphoresis.**—Cataphoretic medication accompanied by the application of bandages to retard local circulation in the parts treated.

**Anæsthesia.**—Insensibility to pain.

**Anæsthesia, Electric.**—Nervous insensibility obtained by electrical means.

**Analogous Pole.**—In a pyro-electric substance like tourmaline, the pole that acquires a positive electrification while the temperature of the crystal is rising.

**Analysis.**—The determination of the composition of a compound substance by separating it into the elementary substances of which it is composed.

**Analysis, Electric.**—The determination of the composition of a compound substance by electric means.

**Analyzable.**—Capable of being analyzed.

**Analyze.**—To separate into component parts.

**Analyzer, Electric.**—A gridiron of metallic wires which is transparent to perpendicularly incident electro-magnetic waves, when the length of the wires is perpendicular to the electric oscillations, but is opaque to them, that is, possesses the ability to absorb or reflect them, when rotated 90° from its former position; i. e., when parallel to the electric oscillations.

**Analyzing.**—Separating into component parts.

**Anaphoresis.**—A term sometimes applied for the electric osmose which occurs in the neighborhood of the anode.

**Anchor.**—In a trolley system the diagonal tie wires which bind the trolley wire longitudinally to adjacent poles in order to maintain a uniform degree of tension in the trolley wire.

**Anchor Log.**—A log partially buried in the ground and serving as an anchor for a telegraphic pole.

**Anchor Platform.**—A frame-work attached to an anchor-pole by means of which the pole is solidly set in the earth.

**Anchor Pole.**—(1) A pole for overhead wires of sufficient stiffness to take the entire tension at points where an abrupt angle occurs, or where the conductors enter underground conduits. (2) A terminal pole.

**Anchor-Ring Core.**—A toroidal core.

**Anchor Strain-Ear.**—In an overhead trolley system a trolley ear or insulator employed for anchoring the trolley wire, or maintaining it taut, so as to ensure good and continuous contact with the trolley wheel.

**Anchored.**—(1) Kept in position by means of an anchor strain-ear. (2) Kept in position by means of an anchor, as a buoy or ship. (3) Maintained in a given position.

**Anchored Filament.**—An incandescent lamp filament supported at its centre to prevent injury to it by excessive vibration.

**Anelectric.**—A word formerly applied to conducting substances which it was believed could not be electrified by friction. (Obsolete.)

**Anelectrotonic State.**—The state or condition of electrotonus.

**Anelectrotonic Zone.**—The polar zone.

**Anelectrotonus.**—The decreased functional activity which occurs in a nerve in the neighborhood of the anode or positive electrode.

**Anemograph.**—A recording anemometer.

**Anemograph, Electric.**—An electrically recording anemometer.

**Anemometer.**—An apparatus for recording the intensity and direction of the wind.

**Anemometer, Electric.**—An apparatus for electrically recording the intensity and direction of the wind.

**Anemometry.**—The measurement of the direction and intensity of the wind.

**Anemoscope.**—An instrument which indicates but does not measure the intensity, or record the direction of the wind.

**Aneroid.**—Devoid of liquid.

**Aneroid Barometer.**—An apparatus for measuring atmospheric pressure, which operates by the to-and-fro movements of one of the walls of a partially exhausted elastic metallic box.

**Angle.**—The deviation of direction between two intersecting lines or planes.

**Angle Cathetometer.**—A cathetometer suitable for measuring angular deviation.

**Angle of Declination.**—(1) The angle which measures the deviation of the magnetic needle to the east or west of the true geographical north. (2) The angle of variation of a magnetic needle.

**Angle of Dielectric Hysteretic Lag.**—In a condenser traversed by an alternating current the angle whose tangent is equal to the ratio of the hysteretic conductance to the hysteretic susceptance of the condenser, or to the angle whose cotangent is the ratio of the hysteretic reactance of condensation to the hysteretic resistance of the condenser.

**Angle of Dip.**—(1) The angle which a magnetic needle, free to move in both a vertical and horizontal plane, makes with the horizontal line passing through its point of support. (2) The angle of inclination of a magnetic needle.

**Angle of Hysteretic Advance of Phase.**

The angle by which the equivalent sine wave of exciting current leads the sine wave of magnetism, in a transformer or choking coil containing iron.

**Angle of Inclination.**—The angle of dip.

**Angle of Lag.**—The angle of lag of a dynamo-electric machine.

**Angle of Lag of Current.**—(1) An angle whose tangent is equal to the ratio of the inductive to the ohmic resistance in a circuit. (2) An angle whose cosine is equal to the ohmic resistance divided by the impedance of a circuit. (3) An angle whose cosine is the ratio of the real to the apparent power in an alternating-current circuit.

**Angle of Lag of Dynamo-Electric Machine.**

(1) The angle through which the axis of magnetization of the armature of a dynamo-electric machine is shifted by reason of the resistance its core offers to cyclic reversals of magnetization. (2) The angle through which the axis of magnetization of the armature of a dynamo-electric machine is shifted by reason of both hysteresis and armature reaction. (3) The backward angular deviation from the normal of the brushes of a motor in order to secure sparkless commutation.

**Angle of Lead.**—The forward angular deviation from the normal position which must be given to the collecting brushes on the commutator of a continuous-current generator in order to obtain quiet commutation.

**Angle of Maximum Sensitiveness of Galvanometer.**

The angle of deflection at which a given small alteration in the current strength produces the greatest deflection of the change in the needle.

**Angle of Polar Span.**—The angular distance which the pole pieces extend circumferentially around the armature bore.

**Angle of Variation.**—The angle of declination of the magnetic needle.

**Angular.**—Of or pertaining to an angle.

**Angular Acceleration.**—The time rate of change of angular velocity.

**Angular Couple.**—The angular force.

**Angular Currents.**—Currents flowing through circuits which intersect one another at any angle.

**Angular Energy.**—The product of one-half the square of the angular velocity and the moment of inertia.

**Angular Force.**—The force which causes the rate of change of angular momentum.

**Angular Momentum.**—The product of

the moment of inertia at any instant and the angular velocity.

**Angular Torque.**—The angular twist or couple.

**Angular Velocity.**—(1) The velocity of a point moving relatively to a centre of rotation or to some selected point, and usually measured in degrees per second, or in radians per second. (2) In a sinusoidal-current circuit the product of 6.2832 and the frequency of the current.

**Angular Wire Gauge.**—A wire gauge measurer formed of a metallic strip containing a tapering, or acute-angled slot with graduated edges.

**Animal Electricity.**—Electricity produced in the bodies of animals during life.

**Animal Magnetism.**—A term sometimes applied to hypnotism or artificial somnambulism.

**Anion.**—The electro-negative ion or radical of a molecule.

**Anisotropic Conductor.**—A conductor which though homogeneous in structure possesses different conductivities in different directions.

**Anisotropic Medium.**—(1) A medium in which equal stresses do not produce equal strains when applied in different directions. (2) An isotropic medium.

**Annealing.**—The art of softening metals by heating and subsequent gradual cooling.

**Annealing, Electric.**—A process for annealing metals in which electric heat is substituted for ordinary heat.

**Annual Inequality of Earth's Magnetism.**—(1) A variation in any of the elements of the earth's magnetism dependent upon the relative position of the sun and earth. (2) Annual variations in the earth's magnetism.

**Annual Load-Factor.**—(1) The ratio between the mean output of a central station in one year, and the maximum output at any time during the year. (2) The ratio between the mean daily output of a central station in one year, and the mean daily maximum output in the same year.

**Annual Variations of Magnetic Needle.**—Variations in the magnetic declination that occur at regular periods of the year.

**Annunciator Board.**—A board on which annunciator drops are placed.

**Annunciator Clock, Electric.**—A clock employed in connection with an annunciator for automatically disconnect



ing certain circuits at certain predetermined times.

**Annunciator Drop.**—An annunciator signal whose dropping indicates the closing or opening of the circuit of a particular electro-magnet connected therewith.

**Annunciator Wire.**—A class of insulated wire prepared for use in annunciator circuits.

**Anodal.**—Of or pertaining to the anode.

**Anodal Diffusion.**—A word sometimes used for cataphoretic medication.

**Anode.**—(1) The conductor or plate of a decomposition cell connected with the positive terminal of a battery or other electric source. (2) The terminal of an electric source out of which the current flows into the electrolyte of a decomposing cell or voltmeter. (3) In a vacuum tube, electrolytic cell, bath, or receptive device, the terminal at which the current enters, as distinguished from the cathode, at which the current leaves.

**Anodic.**—Of or pertaining to the anode.

**Anodic Closure Contraction.**—The muscular contraction produced by the closing of a voltaic circuit, the anode of which is placed over a nerve, and the cathode at some other part of the body.

**Anodic Contraction.**—The muscular contraction produced in the neighborhood of the anode, either on opening or closing the circuit.

**Anodic Currents.**—In a polarized voltaic couple immersed in acidulated water, the electric currents produced by the agitation of the plate connected with the anode.

**Anodic Duration Contraction.**—The time during which a muscle continues contracted on the opening or closing of a circuit whose anode is placed over the part contracted.

**Anodic Electro-Diagnostic Reactions.**—The characteristic reactions which occur at the anode of an electric source placed over any part of a living body.

**Anodic Opening Contraction.**—The muscular contraction produced by the opening of a voltaic circuit the anode of which is placed over a nerve and the cathode at some other part of the body.

**Anodic Rays.**—The radiation claimed to emanate from the anode of an X-ray tube.

**Anodic Zone.**—The zone or region surrounding the anode when employed as a therapeutic electrode.

**Anodograph.**—A word proposed for a radiograph.

**Anomalous.**—(1) Irregular. (2) Not in accordance with the ordinary rule.

**Anomalous Dispersion.**—An abnormal dispersion in which the order of the wave frequencies is inverted as regards their order in ordinary dispersion.

**Anomalous Helix.**—A helix wound so as to produce an anomalous magnet.

**Anomalous Magnet.**—A magnet possessing more than two free poles.

**Anomalous Magnetization.**—(1) The magnetization produced by the oscillatory discharge of a condenser or Leyden jar. (2) Magnetization which produces more than two free poles in a magnet.

**Anomalous Pole.**—A name sometimes given to those poles of an anomalous magnet which consist of two similar adjacent poles.

**Anomalous Solenoid.**—An anomalous helix.

**Anomalous Spiral.**—An anomalous helix.

**Answer Back Signal.**—A return signal.

**Answering Call-Box.**—A call-box at which an answering signal is obtained, indicating that the call has been received at the central station.

**Answering Board.**—In a telephone switchboard the board holding the answering jacks.

**Answering Jacks.**—In any panel of a telephone switchboard the jacks connected with the subscribers whose calling drops are placed in that panel, so that each call may be immediately answered at an adjacent jack.

**Answering Key.**—In a telephone switchboard a lever contact key which enables the operator to bring her head telephone into connection with any subscriber.

**Anti-Cathode of X-Ray Tube.**—(1) A deflection plate placed opposite the cathode of an X-ray tube. (2) A platinum plate supported inside an X-ray tube to receive the cathodic bombardment.

**Anti-Conical System of Distribution.**—A system of conical conductors employed in anti parallel feeding.

**Anti-Hum.**—A device for lessening the humming sound due to the vibration of an aerial wire.

**Anti-Induction.**—Opposing or preventing induction and its effects.

**Anti-Induction Cable.**—A cable whose conductors are so arranged as to avoid the effects of induction, either from themselves or from neighboring conductors.

**Anti-Induction Conductor.**—A con-



ductor constructed so as to avoid injurious inductive effects from neighboring circuits.

**Anti-Induction Telephone Cable.**—

(1) A telephone cable in which the conductors are so arranged as to neutralize the effects of induction produced by neighboring circuits. (2) A telephone cable in which the effects of electrostatic induction from neighboring circuits is avoided by a metallic covering or sheathing that is grounded at suitable intervals.

**Antilogous Pole.**—The pole of a pyroelectric substance like tourmaline, which acquires a negative electrification while the temperature of the crystal is rising.

**Antimonious Lead.**—An alloy of lead and antimony employed for the grid of a storage battery because it is not acted on by the charging current.

**Antinode.**—The point in a vibrating string, wire, or plate, midway between adjacent nodes.

**Anti-Parallel Feeding.**—A method of feeding in a system of parallel distribution in which the pressure at the terminals of all the translating devices is kept approximately uniform by employing mains tapering in opposite directions; that is, with their large ends connected to the generator terminals or bus-bars, and the mains proceeding in opposite directions around the circuit to be supplied.

**Anti phase.**—(1) A phase relation between two periodic currents such that they tend to decrease the amplitude of the motion. (2) Phase opposition.

**Anvil of Telegraph Key.**—The front stop of a Morse telegraph key, upon which the lever descends in signalling.

**Aperiodic.**—(1) Not characterized by periodicity. (2) Devoid of periodicity. (3) Coming to rest steadily without oscillations.

**Aperiodic Galvanometer.**—(1) A galvanometer whose needle comes to rest without any oscillation. (2) A dead-beat galvanometer.

**A-Pole.**—A telegraph double-pole shaped like a letter A.

**Apparent Electromotive Force.**—The E. M. F. apparently acting in a circuit as measured by the drop of pressure due to the resistance of the circuit and the current strength passing through it.

**Apparent Coefficient of Induction.**—A term sometimes used for the apparent inductance in a circuit which either en-

velops iron, or is inductively associated with secondary circuits.

**Apparent Coefficient of Magnetic Induction.**—The apparent permeability of a substance as expressed by the amount of magnetic flux that passes through it per unit of normal cross-sectional area, differing from the true value on account of the presence of eddy currents.

**Apparent Conductor-Resistance.**—The impedance of a conductor which forms part of an alternating-current circuit containing both resistance and reactance.

**Apparent Efficiency of Alternator.**—The ratio of the electric activity delivered at the terminals of an alternator, as the product of volts and amperes supplied, to the activity mechanically absorbed at its pulley or shaft; in contradistinction to the efficiency determined from the true electric activity delivered.

**Apparent Efficiency.**—The efficiency of a generator, motor, or other apparatus, in an alternating-current circuit based upon the volt amperes or apparent power as distinguished from efficiency based on real power.

**Apparent Efficiency of Alternating-Current Motor.**—The ratio of the power mechanically delivered by the motor to the apparent activity it receives at its terminals; as distinguished from the efficiency based upon the real electric activity received.

**Apparent Energy.**—(1) The product of the effective current and the effective pressure in an alternating-current circuit. (2) Apparent activity, as opposed to true activity. (3) In a sinusoidal-current circuit, or simple alternating-current circuit, the product of effective volts and effective amperes uncorrected for the cosine of the angle of their phase difference.

**Apparent Expansion.**—The increase in the volume of a liquid by expansion irrespective of the expansion of its containing vessel.

**Apparent Insulation.**—The insulation resistance of a circuit, uncorrected for the effect of leakage in the measuring current.

**Apparent Impedance.**—(1) In an alternating-current circuit the virtual impedance in a primary circuit due to the presence of an associated secondary circuit. (2) The joint impedance of a network of impedances.

**Apparent Insulation of Telegraphic Line.**—The insulation of a telegraphic line

uncorrected for its conductor resistance, or for the drop in testing potential at the more remote portions.

**Apparent Magnetization.**—The magnetization due to the superposition of two separate magnetizations.

**Apparent Power.**—In an alternating-current circuit, the apparent watts, or the product obtained by multiplying the volts by the amperes, as read directly from a voltmeter and ammeter.

**Apparent Reluctance.**—The reluctance of a magnetic circuit, or portion thereof, under the influence of a complex of such superposed magnetic fluxes as may practically be developed, as distinguished from its reluctance under a single magnetizing force.

**Apparent Resistance.**—The impedance in an alternating-current circuit or portion thereof.

**Apparent Torque Efficiency.**—In an alternating-current motor, the ratio of the torque actually developed to the torque which it would give at the same volt-ampere or apparent electric input in volt-amperes if there were neither internal losses nor phase displacement in the motor.

**Apparent Watts.** The apparent power in an alternating-current circuit as distinguished from the real power.

**Apron Grapnel.**—A form of grapnel for grappling a cable in which the prongs are protected from breakage on rocks by an apron or covering, only a sufficient space being left between the apron and the prongs for the entrance of the cable.

**Aqueous Solution.**—A solution of a salt or other substance in water.

**Arago's Disc.**—A disc of copper or other non-magnetic metallic substance which, when rapidly rotated under a magnetic needle supported independently of the disc, causes the needle to be deflected in the direction of rotation, and, when the velocity of the disc is sufficiently great, to rotate with it.

**Arborescent Discharges.**—Disruptive discharges obtained from a high-potential discharge of a series-connected battery.

**Arborescent Deposits.**—Tree-shaped electro-metallurgical deposits.

**Arc.**—(1) A voltaic arc. (2) A portion of a circle, or other plane curve section.

**Arc.**—To discharge in the form of a voltaic arc.

**Arc Ammeter.**—An ammeter on an arc circuit.

**Arc Blow-Pipe, Electric.**—A blow-pipe

in which the air-blast is obtained by a convective discharge.

**Arc-Circuit Cut-Out.**—A cut-out placed in a series arc-light circuit to prevent the extinguishment of any lamp from breaking the entire circuit.

**Arc-Circuit Cut-Out Box.**—A box for holding an arc-circuit cut-out.

**Arc-Circuit Indicator.**—A device in the form of a simple galvanometer which indicates when the current is passing through an arc-light circuit.

**Arc Crater Photometric Standard.**—A photometric standard based on the intensity of light normally emitted from a definite area of the crater of a carbon voltaic arc.

**Arc, Electric.**—A term sometimes employed for the voltaic arc.

**Arc-Lamp, Electric.**—(1) An electric lamp whose source of light is the voltaic arc. (2) An incandescent electric lamp employed to illumine the circles of telescopes or other instruments in an observatory.

**Arc-Lamp Compensator.**—A reactance choking coil, placed in the circuit of a lamp or lamps for the purpose of automatically regulating the amount of current passing through the lamp or lamps.

**Arc-Lamp Globe.**—A glass globe surrounding the arc of an arc lamp.

**Arc-Lamp Hand-Board.**—An arc-lamp hanger board.

**Arc-Lamp Hanger.**—A board from which an arc lamp is suspended, provided with electric connections for readily short-circuiting the lamp.

**Arc-Lamp Spark-Arrestor.**—A zinc chimney surrounding the arc and employed for the purpose of preventing explosions when arc lamps are placed near combustible materials, as in shop windows.

**Arc-Lamp Suspension-Board.**—(1) A board for suspending an arc lamp. (2) An arc lamp hanger board.

**Arc-Light.**—The light of the carbon voltaic arc.

**Arc-Light Circuit.**—(1) A circuit in which arc-lights are placed. (2) Generally, a series-connected circuit.

**Arc-Light Cut-Out.**—A switch for short-circuiting an arc-lamp and so cutting it out of the circuit. (2) A cut-out which automatically removes an arc-lamp from the circuit.

**Arc Light Diffuser.**—Any diffuser for scattering or diffusing the light from an arc light so as to avoid the production of intense shadows.

**Arc-Light Generator.**—A dynamo-electric machine that furnishes current for arc-light circuits.

**Arc-Light-Points.**—The carbon pencils between which the arc is maintained in an arc light.

**Arc-Light Projector.**—An arc lamp provided with a reflector for obtaining a beam of approximately parallel rays of light.

**Arc-Light Meter.**—A form of electric current timer.

**Arc-Light Regulator.**—A device, generally automatic, for maintaining the carbon of an arc-lamp a constant distance apart during the operation of the lamp.

**Arc-Light Tower.**—A tower employed in outdoor illumination for supporting a number of arc lamps.

**Arc-Light Transformer.**—A transformer which supplies alternating currents to arc-lamps.

**Arc-Lighter.**—An arc-light generator.

**Arc-Lighting.**—Artificial illumination obtained by means of arc lights.

**Arc-Lighting Dynamo-Electric Machine.**—An arc-light generator.

**Arc Plug-Switchboard.**—A switchboard provided with spring-jack contacts connected with the terminals of different circuits, and plug-switches connected with the dynamo terminals, by means of which any dynamo can be connected with any circuit; or a number of circuits connected with the same dynamo; or a number of separate dynamos placed in the same circuit.

**Arc Micrometer.**—An apparatus for measuring the length of a voltaic arc by means of a micrometer.

**Arc Standard of Light.**—A photometric standard based on the intensity of the light emitted by a given area of center of the positive carbon in a carbon arc.

**Arc Switchboard.**—An arc plug-switchboard.

**Arcing.**—Discharging by means of voltaic arcs.

**Areometer.**—An instrument for readily determining the specific gravity of liquids.

**Areometry.**—The measurement of the specific gravity of liquids by means of areometers.

**Argand Electric Burner.**—An Argand burner provided with a device for electrically lighting the gas.

**Argand Electric Lighter.**—An Argand electric burner.

**Argand Valve-Burner or Lighter.**—An Argand burner provided with means whereby the gas can be both turned on and lighted electrically.

**Argymometry.**—The art of determining the weight of electrically deposited silver.

**Arithmetical Mean Value of Periodic Current of E. M. F. Wave.**—The arithmetical average of all the instantaneous values during one complete period.

**Arm of Balance or Bridge.**—One of the resistances of an electric balance or bridge.

**Arms of Balance or Bridge.**—Two separate resistances, the value of one of which is usually a decimal multiple of the other, employed in an electric bridge or balance, in connection with a known resistance, to determine the value of an unknown resistance.

**Armature.**—(1) A mass of iron or other magnetizable material placed on or near the poles of a magnet. (2) The armature of a dynamo-electric machine.

**Armature Bars.**—(1) Heavy copper bars of rectangular or trapezoidal cross-section, or of imbricated rectangular strips, or of rectangular bars of compressed stranded wire, or of special forgings, employed on large drum armatures in place of the ordinary wire windings. (2) Heavy conductors employed for armature windings.

**Armature Binding Wires.**—Coils of wire bound on the outside of the armature wires for the purpose of preventing their separating from the armature core by centrifugal force.

**Armature Bore.**—The space between the pole-pieces of a dynamo or motor provided for the rotation of the armature.

**Armature Chamber.**—(1) The armature bore. (2) An armature pocket.

**Armature Chambers.**—Spaces left in the armature core for the reception of the armature coils.

**Armature Core-Discs.**—The thin discs of sheet-iron that form, when assembled, the laminated core of the armature of a dynamo or motor.

**Armature Core of Dynamo.**—The mass of laminated iron on which the armature coils or conductors of a dynamo or motor are placed.

**Armature Covering.**—A covering of canvas or other suitable material placed on an armature for the purpose of protecting its conductors from injury or dirt.



**Armature Hole.**—(1) The armature bore. (2) A hole made in the core for the reception of an armature coil or winding.

**Armature Inductors.**—The bars, strips, or coils, placed on the dynamo armature core, in which electromotive forces are induced by rotation.

**Armature Loop.**—The single conducting coil or loop on a dynamo or motor armature.

**Armature of Cable.**—The sheathing or protective coat placed on the outside of a cable.

**Armature of Condenser.**—A term sometimes applied to the metallic plates or coatings of a condenser or Leyden jar.

**Armature of Dynamo.**—(1) Coils of insulated wire together with the iron core on or around which such coils are wound. (2) That part of a dynamo in which useful differences of potential or useful currents are generated. (3) Generally that part of a dynamo which is revolved between the pole-pieces of the field magnets. (4) That member of a dynamo in which the magnetic flux is caused to successively fill and empty the coils and thereby generate E. M. F's.

**Armatures of Holtz Machine.**—The pieces of paper that are placed on the stationary plate of a Holtz, or other similar electrostatic induction machine, near the openings in the same.

**Armature Pinion.**—A toothed wheel placed on the armature shaft of a street-car motor for engaging the teeth of the reducing gear.

**Armature Pockets.**—Spaces provided in an armature core for the reception of the armature coils.

**Armature Projections.**—Those portions of the armature core between which the armature slots, pockets, or chambers are situated.

**Armature Reaction.**—The reactive magnetic influence produced, by the current in the armature of a dynamo or motor, on the magnetic circuit of the machine.

**Armature Segment.**—That portion of an armature winding, or armature inductor, whose circuit is included between two contiguous segments of the commutator.

**Armature Slots.**—Slots provided in an armature core for the reception of the armature coils.

**Armature Spider.**—A metal frame-work, keyed to the armature shaft, and provided with radial arms for firmly holding the armature core.

**Armature Stampings.**—Stampings of soft sheet iron intended for the core discs of a laminated armature core.

**Armature Turns.**—The separate turns of conductors on the armature of a dynamo or motor.

**Armature Varnish.**—An insulating varnish sometimes applied to armature windings for the purpose of increasing the powers of resisting moisture and friction.

**Armature Winding-Space.**—Longitudinal grooves or spaces left in the armature core for the reception of the armature coils.

**Armed Magnet.**—A magnet provided with an armature.

**Armor of Cable.**—The protecting sheathing or metallic covering of a submarine or other electric cable.

**Armored.**—Provided with armor, as of the protective sheathing of a cable.

**Armored Cable.**—A cable provided with a protective sheathing or armor.

**Armored Conductor.**—A conductor provided with a protective sheathing or armor.

**Army Telegraph.**—The telegraphic apparatus employed in field service in the army.

**Arrester Plate of Lightning Protector.**—The ground-connected plate of a comb lightning-arrester.

**Arrester Plates.**—A term sometimes applied to the two plates of an ordinary comb lightning-protector.

**Arrival Curve of Current in Submarine Cable or Telegraphic Circuit.**—A curve showing the gradual increase in the strength of current reaching the receiving end of a submarine cable under a given condition of signaling.

**Articulate Speech.**—The successive tones of the human voice that are necessary to produce intelligible words.

**Artificial Cable.**—A circuit containing associated resistance and capacity, and employed in a system of duplex submarine telegraphy corresponding to the artificial line in duplex aerial line telegraphy.

**Artificial Cable Leak.**—A leak purposely introduced at some point in the circuit of an artificial cable employed in duplex cable telegraphy.

**Artificial Carbons.**—Carbons obtained by the carbonization of a mixture of pulverized carbon with a carbonizable liquid



**Artificial Fault in Cable.**—A fault purposely made in an artificial cable for the purpose of studying its behavior under tests.

**Artificial Illumination.**—The employment of artificial sources of light.

**Artificial Line.**—In duplex telegraphy a combination of resistance coils and condensers which serves to balance an actual telegraph line.

**Artificial Magnet.**—A magnet produced by induction from another magnet or from an electric current.

**Asbestos Porcelain.**—A porous substance, somewhat resembling ordinary porcelain, employed for the porous cells of voltaic batteries.

**A-Side of Quadruplex Table.**—That side of a quadruplex system which is worked by means of reversed currents.

**Asphyxia.**—Suspended respiration eventually resulting in death from non-aeration of the blood.

**Assumed Direction of Flow of Current.**—A convention which regards the current as leaving an electric source at its positive pole, and returning to it at its negative pole.

**Asymmetrical.**—Devoid of symmetry.

**Asymmetrical Resistance.**—A resistance which is claimed to be greater to a flow of current in one direction than in another.

**Astatic.**—Devoid of magnetic directive power.

**Astatic Circle.**—A term sometimes used for astatic circuit.

**Astatic Circuit.**—A circuit, consisting of two closed curves enclosing equal surfaces, which is not deflected by the earth's field on the passage of a current through it.

**Astatic Couple.**—Two magnets of equal strength so placed one above the other in a vertical plane as completely to neutralize each other's effects.

**Astatic Galvanometer.**—A galvanometer provided with an astatic needle or circuit.

**Astatic Multiplier.**—An astatic galvanometer.

**Astatic Needle.**—(1) A compound magnetic needle of great sensibility, possessing little or no directive power. (2) An astatic needle consisting of two separate needles rigidly connected and placed parallel one directly over the other with opposite poles opposed.

**Astatic Pair.**—An astatic couple.

**Astatic System.**—An astatic combination of magnets.

**Astaticizing.**—Rendering a system astatic.

**Astigmatism.**—A defect in the lenses of the eye which prevents horizontal and vertical lines from being in focus at the same time.

**Astronomical Meridian.**—A great circle passing through any point of the heavens and the north and south poles of the heavens.

**Asymptote of Curve.**—A straight line which continually approaches a curved line, but which meets it only at an infinite distance.

**Asynchronism.**—Devoid of synchronism.

**Asynchronous.**—Occurring or acting non-simultaneously.

**Asynchronous Alternating-Current Motor.**—A motor whose speed is not synchronous with that of its driving generator, both machines having the same number of poles.

**Atmosphere.**—(1) A unit of gaseous or fluid pressure equal to 14.73 pounds per square inch. (2) The ocean of air which surrounds the earth.

**Atmospheric.**—Of or pertaining to the atmosphere.

**Atmospheric Cathode Discharge.**—An X-ray discharge which is assumed to accompany and form part of the sun's radiation.

**Atmospheric Electricity.**—The free electricity which is present in the atmosphere.

**Atom.**—(1) An ultimate particle of matter. (2) The smallest quantity of elementary or simple matter that can exist.

**Atom of Electricity.**—A quantity of electricity equal in amount to that possessed by any chemical monad atom.

**Atomic.**—Of or pertaining to the atom.

**Atomic Attraction.**—(1) The attraction which causes the atoms to combine. (2) Chemical affinity.

**Atomic Capacity.**—The equivalence or valency of an atom.

**Atomic Currents.**—A term sometimes employed instead of molecular or Amperean currents.

**Atomic Energy.**—Chemical potential energy.

**Atomic Heat.**—A constant product obtained by multiplying the specific heat of an elementary substance by its atomic weight.

**Atomic Weight.**—The relative weight of the atoms of elementary substances.

**Atomicity.**—(1) The combining capacity of the atoms. (2) The relative equivalence of the atoms, or their atomic capacity.

**Atomization.**—The act of obtaining liquids in a spray of finely divided particles.

**Atomize.**—To separate into a spray by means of an atomizer.

**Atomizer.**—An apparatus for readily obtaining a finely divided jet or spray of liquid.

**Attachment Plug.** A plug provided for insertion in a screw socket or spring jack, for the ready connection of a lamp or other receptive device to a circuit.

**Attract.**—To draw together.

**Attracted-Disc Electrometer.**—A form of electrometer in which the force is measured by the attraction existing between two charged discs.

**Attracting.**—Drawing together.

**Attraction.**—Literally the act of drawing together.

**Attraction of Gravitation.**—(1) Mass attraction; or, the attraction which causes masses of matter to tend to move towards one another. (2) The attraction which causes bodies to fall to the earth. (3) Molar attraction.

**Attractions and Repulsions of Currents.**—The tendency of active circuits to be attracted to or repelled from one another by the mutual action of their magnetic fields.

**Audible Code.**—A term employed in railway signalling for a code of audible signals in railway service.

**Audible Telegraphic Signal.**—A signal which is received by the ear in contradistinction to a visual signal or one received by the eye.

**Audiometer.** A form of induction balance or sonometer employed in testing the acuteness of hearing.

**Audiphono.**—A thin plate of hard rubber held in firm contact with the teeth and maintained at a certain tension by strings attached to one of its edges, employed for the purpose of aiding the hearing.

**Auger.**—A boring tool for cutting holes for telegraph poles.

**Aura, Electric.**—A term sometimes applied to an electric brush or convective discharge.

**Aural Electrode.**—An electrode suitably

shaped for the therapeutic treatment of the ear.

**Aurora.**—(1) Luminous sheets, columns, arches, or pillars of pale flashing light, generally of a reddish color, seen in the Northern and Southern heavens. (2) The Northern and Southern lights.

**Aurora Australis.**—(1) The Southern light. (2) A name given to an appearance in the Southern heavens similar to that of the aurora borealis.

**Aurora Borealis.**—The Northern light.

**Aurora Glory.**—A term proposed for the almost constant crown or crowns of light, which occupy a nearly fixed position in the heavens during the continuance of an aurora.

**Aurora Polaris.**—A general name for the aurora borealis or the aurora australis.

**Auroral.**—Of or pertaining to an aurora.

**Auroral Arch.**—An arch-like form sometimes assumed by the auroral light.

**Auroral Bands.**—Approximately parallel streams of light that are sometimes seen during the prevalence of an aurora.

**Auroral Coronae.**—Crown-shaped appearances sometimes assumed by the auroral light.

**Auroral Curtain.**—A curtain-shaped sheet of auroral light.

**Auroral Flashes.**—(1) Sudden variations in the intensity of the auroral light. (2) Intermittent flashes of auroral light.

**Auroral Light.**—The light given off by an aurora.

**Auroral Storm.**—An unusual prevalence of auroras.

**Auroral Streams.**—Auroral streamers.

**Auroral Streamers.**—Flashing columns or pillars of light that are emitted from portions of the sky during the prevalence of an aurora.

**Austral.**—Of or pertaining to the South.

**Austral Fluid.** A term formerly employed for that magnetic fluid which was supposed to exist around or to emanate from the austral pole of a magnet.

**Austral Magnetic Pole.**—(1) The name formerly employed in France for the north-seeking pole of a magnet. (Not in general use.) (2) That pole of a magnet which points to the earth's geographical north. (Not in general use.)

**Auto-Car.**—(1) An automobile car. (2) A car provided with storage batteries.

**Auto-Converter.**—(1) A choking coil connected across a circuit and tapped at various points to enable a reduced E. M. F.

to be obtained. (2) An auto-transformer. (3) A choking coil connected to an induction motor by a switch in such a manner as to facilitate the starting of the motor under load.

**Auto-Excitation.**—Self-excitation.

**Auto-Exeiting.**—Self-exeiting.

**Autographic Telegraphy.**—(1) Facsimile telegraphy. (2) A writing telegraph.

**Auto-Induction.**—A word sometimes employed instead of self-induction.

**Auto-Kinetic System of Fire Telegraphy.**—A system of fire telegraphy in which the transmitters are connected in series in a pair of circuits, so that, when an alarm is being transmitted from one alarm point, no other alarm, received at the same time, will be transmitted until the first has been recorded.

**Automatic Annunciator Drop.**—An annunciator drop which on the closing of a distant circuit falls and holds the circuit closed until the drop is raised.

**Automatic Answer-Back.**—An automatic return signal call-box.

**Automatic Argand Burner.**—An Argand burner furnished with a device by means of which it can be either automatically lighted or extinguished at a distance.

**Automatic Gas Cut-Off.**—A device for automatically cutting out the battery from an electric gas-lighting circuit, on the accidental grounding of the circuit.

**Automatic Guard for Series-Connected Incandescent Lamps.**—(1) An automatic cut-out, placed on a series-connected incandescent lamp, for the purpose of short circuiting the holder should the lamp filament break. (2) A film cut-out.

**Automatic Indicating-Grapple.**—A grapple which automatically completes the circuit of an electric bell or indicator on a cable ship, as soon as the cable is hooked.

**Automatic Indicator.**—Any automatic device for electrically indicating the number of times a circuit has been opened or closed, thus showing the number of times any operation has occurred, which has caused the opening or closing of the circuit.

**Automatic Indicator for Grapple.**—An apparatus employed with a grapple for indicating when the grapple comes off the sea bottom.

**Automatic Inker.**—An ink-writing Morse

recorder which is automatically self-starting upon its operation by telegraphic currents.

**Automatic Interrupter.**—An automatic contact-breaker.

**Automatic Locking-Switch.**—A combined key and switch employed in submarine cables, whereby the switch is automatically locked and thus prevented from being left for sending, when it should be left for receiving, or vice-versa.

**Automatic Make-and-Break.**—A device whereby the to-and-fro movements of the armature of an electro-magnet are caused to automatically make and break its circuit.

**Automatic Multiple-Transmitter.** In a telegraphic signalling or calling system, the means whereby the requisite number of spacing and electric impulses for any of a number of different calls, is automatically sent over a line, in order to produce a given signal, such for example, in a system of police telegraphy, as a call for an ambulance, a call for a squad, etc.

**Automatic Oiler.**—An oil cup or reservoir that automatically spreads oil over the bearing of a machine in motion.

**Automatic Overload-Switch for Storage Battery.**—An automatic electromagnetic switch, inserted in the discharging circuit of a storage battery, by means of which, when the discharging current exceeds a certain safe limiting strength, it is automatically opened.

**Automatic Paper-Winder.**—An apparatus for carrying and automatically winding the paper fillet or strip used on telegraphic registers.

**Automatic Photo-Electric Switch.**—A switch that is automatically opened or closed on the exposure of its face to differences of illumination.

**Automatic Regulation of Dynamo-Electric Machine.**—Such a regulation of a dynamo electric machine as will automatically preserve constant, either the current strength or the potential difference at its terminals.

**Automatic Regulation of Motor.**—Such a regulation of a motor as will maintain constant its speed, or its torque.

**Automatic Regulator.**—A device for securing automatic regulation of a dynamo or motor, as distinguished from hand regulation.

**Automatic Repeater.**—A telegraphic repeater which is automatically operated, in contradistinction to a manual repeater which is operated or controlled by hand.



**Automatic Rheostat.**—An automatic variable resistance.

**Automatic Rheotome.**—An automatic contact-breaker.

**Automatic Ringing - Through.**—A means by which in junction telephone working the attention of the distant exchange can be secured by the act of establishing connection at the originating exchange without the necessity of calling up the distant exchange after connection has been made.

**Automatic Search-Light.**—A search-light in which a parallel, or slightly divergent beam of light, is caused automatically to sweep the horizon and thus disclose the approach of a torpedo boat or other similar danger.

**Automatic Signalling.**—Telegraphic transmission by machine-made contacts as distinguished from telegraphic signalling by hand.

**Automatic-Call-Box.** A form of telephone call-box by means of which the service of a telephone exchange can be obtained by a payment made into a box, thus dispensing with the services of an attendant.

**Automatic Chemical Telegraphy.**—Automatic telegraphy in which the signals are recorded on a fillet or band of chemically prepared paper.

**Automatic Circuit-Breaker.**—A device for automatically opening a circuit when the current passing through it is excessive.

**Automatic Clearing Indicator.**—(1) A self-restoring drop. (2) A clearing indicator at a telephone exchange on a junction line, which automatically indicates when the conversation has terminated.

**Automatic Contact-Breaker.** A device for causing an electric current to rapidly make and break its own circuit.

**Automatic Counter.**—In railway block-signalling, an electro-magnetic device for recording and indicating the signals of an audible code.

**Automatic Curb-Sender.**—In submarine telegraphy, a transmitter in which each signal is curbed automatically; i. e., each signal is followed by one or more alternately directed impulses before earthing, for the purpose of clearing the line of its static charge.

**Automatic Cut-In.**—Any arrangement of parts that will automatically introduce a translating device or an electric source into a circuit on the occurrence of any predetermined event.

**Automatic Cut-Out.**—Any arrangement of parts that will automatically cut-out or remove a translating device or an electric source from a circuit on the occurrence of a predetermined event.

**Automatic Cut-Out for Storage Battery.**—An automatic electro-magnetic switch, inserted into the charging circuit of a storage battery, so arranged that if the charging current falls below a safe limiting strength the charging circuit will be opened.

**Automatic Cut-Out for Multiple-Connected Electro-Receptive Devices.**—(1) A device for automatically cutting an electro-receptive device, such as a lamp, out of a circuit. (2) A safety catch or safety base.

**Automatic Cut-Out for Series-Connected Electro-Receptive Devices.** Means whereby an electro-receptive device, such as an arc lamp, is to all intents and purposes automatically cut out of, or removed from, a circuit, by means of a shunt of low resistance which permits the greater part of the current to flow past the lamp.

**Automatic Cut-Out of Magneto.**—A cut-out switch for automatically removing the armature of a magneto from the telephone circuit by the action of a spring, as soon as the handle is released.

**Automatic Drop.**—An automatic annunciator drop.

**Automatic Electric Alarm-Bell.**—An electric alarm-bell furnished with an automatic contact breaker.

**Automatic Electric Bell.**—(1) A trembling or vibrating bell. (2) An automatic electric alarm-bell.

**Automatic Electric Gas-Burner.**—An electric device for both turning on the gas and lighting it, and turning the gas off, and thus extinguishing the light, by alternately touching different buttons.

**Automatic Electric Safety System for Railroads.**—A system for automatically preventing the approach of two trains, whatever their speed, beyond a predetermined distance from each other.

**Automatic Fire-Alarm.**—An instrument for automatically telegraphing an alarm of fire from any locality on its increase in temperature beyond a certain predetermined point.

**Automatic Fire-Annunciator.**—An annunciator for automatically indicating the point from which a fire-alarm has been sent.

**Automatic Steam-Whistle, Electric.**—



A steam-whistle employed in absolute block systems for railroads, whereby, during fogs or snow-storms, when the signals are hidden from view, the locomotive, on passing over a portion of the road at a convenient distance from the signal, is caused to make a succession of electric contacts, whereby a steam whistle is blown on the moving train.

**Automatic Switch.**—(1) A switch which is automatically opened or closed on the occurrence of certain predetermined events. (2) In double-current telegraphy an electro-magnetic switch which enables the distant station to stop the sending operator at the home station.

**Automatic Switch for Incandescent Electric Lamps.**—(1) A safety fuse or safety cut-out. (2) Any switch by means of which incandescent lamps can be lighted or extinguished at a distance. (3) A device for automatically closing the circuit of a lamp or lamps on the opening of a door, or passage of a barrier. (4) A device for automatically opening the circuit of a lamp or lamps after the expiration of a predetermined time or at the closing of a door.

**Automatic Telegraph.**—A general term embracing the apparatus employed in automatic or machine telegraphy.

**Automatic Telegraph-Sounder.**—A form of automatic telegraphic transmitter.

**Automatic Telegraph-Transmitter.**—(1) A device for automatically transmitting signals by means of embossed or perforated slips drawn under suitable contact devices. (2) A transmitter employed in automatic telegraphy for sending prepared messages.

**Automatic Telegraphy.**—A system of telegraphy by means of which a telegraphic message is automatically transmitted over a line by the motion of a previously perforated fillet of paper, the perforations of which are arranged in the order and length required to form the characters to be transmitted.

**Automatic Telephone-Exchange.**—A system of telephony in which the subscribers are able to secure selective inter-communication without the aid of an exchange operator.

**Automatic Telephone Hook.**—An automatic telephone switch, operated by hanging up the telephone used in connection with it.

**Automatic Telephone Switch.**—(1) A device for automatically transferring the connection of the main line from the tele-

phone to the call-bell by the weight of the telephone when hung up. (2) A switch operated by the act of hanging up or taking down a telephone from a hook and employed to introduce or remove a call-bell from the line.

**Automatic Time Cut-Out.**—A device which automatically cuts a translating device or an electric source from a circuit at a certain predetermined time, or after the lapse of a predetermined time.

**Automatic Variable Resistance.**—A resistance the value of which can be automatically varied.

**Automatically Regulable.**—Capable of automatic regulation.

**Automatically Regulate.**—To regulate in an automatic manner.

**Automobile.**—(1) Self-movable. (2) Containing the power necessary for its own motion.

**Automobile Carriage.**—A horseless carriage.

**Automobile Torpedo.**—A torpedo which contains the power required for its propulsion.

**Automobile Vehicle.**—An automobile carriage.

**Auto-Reversible Tele-Radiophone.**—(1) A photophone arranged so that a number of telegraphic communications may be simultaneously sent either all in the same direction, or part in one direction, and the remainder in the opposite direction. (2) A multiple tele-radiophone.

**Auto-Starter.**—(1) A self-starting mechanism. (2) A self-starting ink-writer. (3) A self-starting motor.

**Auto-Telephone System.**—A system of multiple-circuit telephony in which a single battery is employed, whereby a number of telephone stations can be connected by a single cable without the use of a distributing board, or exchange.

**Auto-Transformer.**—A one-coil transformer consisting of a choking coil connected across a pair of alternating-current mains, and so arranged that a current or pressure differing from that supplied by the mains can be obtained from it by tapping it at different points.

**Auxiliary Bus.**—A central-station busbar connected to an auxiliary pressure; i. e., a pressure different from the main-station pressure.

**Auxiliary Alarm Telegraph.**—In a system of fire-alarm telegraphy, where an alarm received in any one circuit is automatically repeated over all the other cir-

uits, means whereby the repetition of the signals are prevented from interfering with the incoming signals of any of the other circuits.

**Average Efficiency of Motor.**—(1) The efficiency of an electric motor based on its average or mean load. (2) The ratio of all the work that a motor delivers in a given time to the electric energy it has absorbed in that time.

**Average Electromotive Force.**—The mean electromotive force.

**Average Life of Incandescent Lamp.**—The mean time during which a number of incandescent lamps will continue to burn without breaking when connected with a circuit of given pressure.

**Average Value of Periodic Current or E. M. F.**—The arithmetical mean value of a periodic current or E. M. F., with respect to magnitude and without respect to sign or direction.

**Avogadro's Hypothesis.**—Equal volumes of different gases measured at the same temperature and pressure contain the same number of molecules.

**Axes of Co-Ordinates.**—A vertical and a horizontal line, usually intersecting each other at right angles, and called respectively the axes of ordinates and abscissas, from which the ordinates and abscissas are measured.

**Axial.**—Of or pertaining to an axis.

**Axial Current.**—In electro-therapeutics, a current flowing in a nerve in the opposite direction to the normal impulse of the nerve.

**Axial Magnet.**—A name sometimes given to a solenoid with a straight core.

**Axis of Abscissæ or Abscissas.**—The horizontal line in the axes of co-ordinates.

**Axis of Magnetic Needle.**—A straight line drawn through a magnetic needle, and joining its poles.

**Axis of Ordinates.**—The vertical line in the axes of co-ordinates.

**Azimuth.**—In astronomy, the angle subtended at an observer between the plane of an azimuth circle and the plane of the meridian.

**Azimuth Circle.**—The arc of a great circle passing through the zenith, or the point of the heavens directly overhead, and the nadir, or the point directly beneath.

**Azimuth Compass.**—(1) A compass used for measuring the horizontal angular distance of any distant object from the magnetic meridian. (2) The mariner's compass.

**Azimuth Telegraph.**—On a war-ship a telegraph for indicating at any or all guns the azimuth of a target.

**Azimuth and Range Telegraph.**—On a war-ship a combined telegraph to the guns of the azimuth and range of a target.

## B

**B.**—A symbol for magnetic intensity, or induction density, usually expressed in C. G. S. units per normal square centimetre. (Partly International usage.)

**B.**—(1) A symbol for magnetic induction, or the amount of flux per normal square centimetre of the magnetized material. (2) A symbol for susceptance in alternating current circuits.

**B. A. Ampere.**—The British Association ampere in a circuit whose resistance is one B. A. ohm under an E. M. F. of one B. A. volt.

**B. A. Balance.**—A type of balance or bridge, originally employed by the British Association Committee in duplicating B. A. ohms.

**B. A. Ohm.**—(1) The British Association ohm. (2) The resistance of a column of mercury one square millimetre in area of normal cross-section, and 104.9 centimetres in length, at the temperature of zero centigrade.

**B. A. U.**—A contraction for British Association unit or ohm.

**B. A. Unit.**—The British Association unit of resistance or ohm.

**B. S. G.**—A contraction for British standard gauge.

**B. & S. W. G.**—A contraction for Brown and Sharpe's wire gauge.

**B. T. U.**—(1) A contraction for British thermal unit. (2) A contraction for Board of Trade unit.

**B. W. G.**—A contraction for Birmingham wire gauge.

**Back Ampere-Turns.**—Ampere-turns on a dynamo armature which tend to oppose the flux produced by the field magnets.

**Back Electromotive Force.**—A term sometimes used for counter-electromotive force.

**Back Induction.**—An induction opposed to the field and tending to weaken or neutralize it.

**Back Magnetization.**—A term sometimes used for backward or back induction.

**Back Magnetisation of Armature.**—Counter-magnetomotive forces acting in the main magnetic circuit of the field coils, and tending to reduce the useful flux passing through the armature.

**Back of Electro-Magnet.**—The yoke of an electro-magnet.

**Back Pitch.**—The backward pitch of the armature windings.

**Back Stroke of Lightning.**—The return stroke of lightning.

**Back Stop of Key.**—A stop placed on the back of a telegraph key in order to limit its motion in the direction of release.

**Back-Turns of Armature.**—(1) Those turns on an armature whose current tends to demagnetize the field. (2) The back ampere-turns.

**Backing Metal.**—An alloy that is placed on the back of the copper shell of an electrotype in order to stiffen it.

**Backing Pan.**—The pan in which the copper shell of an electrotype is placed in order to receive its backing of type metal.

**Backward Induction of Dynamo Armature.**—The component of the armature induction that opposes the induction of the field magnets.

**Backward Pitch of Armature Windings.**—A pitch which is always left-handed, or counter-clockwise, when regarded from the commutator side.

**Backward Waves.**—In a closed circuit supplied by a dynamo or other source of electromotive force, a wave of potential that is assumed to start from the negative pole of the dynamo and travel around the circuit in the opposite direction to the forward wave of positive potential from the positive pole of the dynamo.

**Bad Earth.**—A term sometimes applied to a bad ground or a connection to earth whose electric resistance is comparatively high.

**Bain Telegraph Code.**—An old form of telegraphic alphabet originally employed in connection with the Bain printing instrument.

**Bain's Chemical Recorder.**—An apparatus for recording the dots and dashes of a telegraphic despatch on a sheet of chemically prepared paper.

**Bain's Chemical Solution.**—Bain's printing solution.

**Bain's Printing Solution.**—(1) The solution used in Bain's chemical recorder. (2) A solution of potassium ferro-cyanide and water.

**Baking Oven, Electric.**—An electrically heated baking oven.

**Balance Arm.**—One of the arms of an electric balance.

**Balance Arms.**—The arms of an electric balance.

**Balance, Electric.**—A term sometimes used for an electric bridge.

**Balance Galvanometer.**—A dynamo galvanometer employed for indicating when the pressure of the dynamo is equal to the pressure on the bus bars.

**Balance Indicator.**—Any device for indicating when an electric balance has been obtained.

**Balance Indicator of Three-Wire System.**—A device for indicating when a balance is obtained between the positive and negative leads of a three-wire system of distribution.

**Balance of Induction in Cable.**—The neutralization of induction in a cable by the presence of equal and opposite effects.

**Balance of Telegraphic Circuit.**—The condition of a duplexed telegraph line when the home relay ceases to respond to the home key.

**Balance Photometer.**—A photometer based on the decomposition of iodide of nitrogen by the action of light.

**Balanced Armature.**—(1) An armature whose weight is symmetrically distributed as regards its axis of rotation. (2) An armature that has been so adjusted by the addition of weights that its weight is symmetrically distributed with reference to its axis of rotation.

**Balanced Circuit.**—A telephonic, telegraphic, or other circuit which has been so erected and adjusted as to be free from mutual inductive disturbances from neighboring circuits.

**Balanced Load.**—A load which is symmetrically divided between two or more generating units, as in the three-wire, five-wire, multiple, or polyphase systems of distribution.

**Balanced Magnetic Circuits of Armature.**—The magnetic circuits traversing the armature of a dynamo-electric machine through which the magnetic fluxes produced by the field are symmetrically distributed in regard to flux density, total flux, and geometrical distribution.

**Balanced Metallic Circuit.**—A metallic



circuit, the two sides of which have similar electric properties.

**Balanced Polyphase System.**—A polyphase system all the branches of which are symmetrical in regard to their electromotive force, current, and phase.

**Balanced Reaction Coil.**—A coil employed in a system of distribution by alternating-current transformers for maintaining a constant current in the secondary circuit or circuits despite changes in the load placed therein.

**Balanced Resistance.**—A resistance so placed in a bridge or balance as to be balanced by the remaining resistances in the bridge.

**Balanced System.**—An electric system of distribution or communication which is so adjusted as to be free from mutual inductive disturbances from neighboring systems.

**Balancing.**—Rendering a metallic telephone circuit free from inductive disturbances from other lines.

**Balancing Coil of Armature.**—An auxiliary field-winding in series with an armature, and having its magnetomotive force equal and opposite to that of the armature current, so that their total magnetic effect upon the field is zero, and the field flux remains unchanged at all loads.

**Balancing of Telegraph Line.**—In duplex or quadruplex telegraphy the operation of adjusting the balance between the real and artificial lines, whereby the home signals do not affect the receiving instruments.

**Balancing Relay.**—A differentially wound relay.

**Balancing Resistance for Dynamos.**—A regulating resistance that possesses a sufficient range to balance one dynamo against another with which it is operated in parallel.

**Balancing Thermopile.**—(1) A double thermopile. (2) A differential thermopile.

**Balancing Wire or Conductor.**—A term sometimes employed for the neutral wire or conductor of a three-wire system.

**Balata.**—An insulating material.

**Ball Lightning.**—A name sometimes given to globular lightning.

**Ballistic Curve.**—The curve actually described by a projectile thrown through the air in any other than a vertical direction.

**Ballistic Galvanometer.**—(1) A galvanometer designed to measure the total quan-

tity of electricity in a discharge lasting for a brief interval, as, for example, the current caused by the discharge of a condenser. (2) A galvanometer, in which the movable part is as little damped as possible, suitable for measuring electric charges or discharges, and usually adjusted to have a long period of vibration or slow swing.

**Ballistic Pendulum.**—A pendulum with a heavy bob employed to determine the velocity of a projectile fired into it.

**Balloon Buoy.**—A buoy used in submarine cable work somewhat resembling a balloon in shape.

**Balloon, Electric.**—(1) A balloon or airship provided with electric power so as to be capable of being started or moved against the direction of the wind. (2) An electrically dirigible balloon.

**Balloon Signalling for Military Purposes.** Transmitted intelligence, as of the movements of an enemy's army, from observations made in balloons by means of telephone circuits directly connected with the balloons.

**Band Arc Lamp.**—An arc lamp in which the feeding of the carbons is effected through the movements of a band of copper, which carries the upper carbon holder and conducts the current into the arc.

**Band or Banded Spectrum.**—The condition assumed by the spectrum of a compressed gas or vapor when sufficiently heated, in which the lines of the ordinary spectrum are broadened into bands.

**Banjo.**—A wooden drum fastened upon a kite-shaped board, employed for tightening a pole-strung telephone or telegraph wire.

**Bank Board.**—A small switchboard containing a bank of lamps used in an alternating current series incandescent system of street lighting, and usually supplied with an ammeter and switch for introducing one or more relief lamps.

**Bank of Lamps.**—A group of electric lamps collected together in a common structure, usually for the purpose of obtaining a load.

**Bank of Transformers.**—A group of transformers collected together in a common structure usually either for the purpose of obtaining a load, or for readily varying the pressure.

**Banked Battery.** A term sometimes applied to a battery from which a number of separate circuits are supplied with current.

**Banking Transformers.**—(1) Grouping



transformers in a common structure either for the purpose of obtaining a load, or for readily varying the pressure. (2) Associating transformers in parallel. (3) Associating transformers in series.

**Bar Armature.**—An armature whose conductors are formed of bars.

**Bar Electro-Magnet.**—An electro-magnet the core of which is in the form of a straight bar or rod.

**Bar Windings.**—Armature windings composed of copper bars.

**Bar-Wound Armature.**—An armature in which the conductors have the form of bars.

**Barad.**—(1) A unit of intensity of pressure. (2) A dyne per square centimetre.

**Baro Arc-Light Carbons.**—Arc-light carbons or pencils unprovided with an electro-plating of copper or other conducting metal.

**Baro Carbons.**—Arc-light or battery carbons, unprovided with an electro-plating of copper.

**Barker's Wheel.**—An early form of reaction water wheel.

**Barlow's Wheel.**—A wheel or disc of metal, capable of rotation on an axis, that is set into rotation when placed between the poles of magnets and traversed between its centre and circumference by a current of electricity.

**Barometer.**—An apparatus for measuring the atmospheric pressure.

**Barometric Column.**—A column, usually of mercury, approximately 30 inches in vertical height, sustained in a barometer or other tube by the atmospheric pressure.

**Barometric Gradient.**—The drop or fall of atmospheric pressure per unit of distance as measured between two adjacent isobars.

**Barrel of Jack.**—In telephony a conducting cylinder in a jack for making contact with the sleeve of a plug.

**Barrow-Reel.**—A reel supported on a barrow for convenience in paying out an overhead conductor during its installation.

**Bar Winding of Armature.**—A winding consisting of insulated copper bars connected at their extremities.

**Base Frame of Generator.**—The frame on which a generator is supported.

**Basis Metal of Electro-Plating.**—The metal on whose surface an electro-plating is to be deposited.

**Batch Working.**—In telegraphy a method of operating consisting in sending a plurality of messages in one direction over a line, and then a plurality of messages in the opposite direction, as distinguished from up-and-down working.

**Bathometer.**—An instrument for obtaining deep-sea soundings without the use of a sounding-line.

**Battery.**—A name frequently used for an electric-battery.

**Battery.**—(1) To place a storage battery on a storage-battery car. (2) To supply a battery to a station or circuit.

**Battery Car.**—A storage-battery car.

**Battery, Electric.**—A general name applied to the combination, as a single source, of a number of separate electric sources.

**Battery Gauge.**—A form of portable galvanometer suitable for ordinary battery testing work.

**Battery Jar.**—A jar provided for holding the electrolyte of each of the separate cells of a primary or secondary battery.

**Battery Lamp.**—An incandescent lamp of such low voltage as to be readily operated by the ordinary voltage of a battery of a few series-connected cells.

**Battery Motor.**—An electric motor so wound as to be properly operated by the comparatively low electromotive force of an ordinary battery.

**Battery of Alternators.**—A number of separate alternators so connected as to be capable of acting as a single alternator.

**Battery of Generators.**—A number of separate generators so connected as to be capable of acting as a single generator.

**Battery Pole-Changer.**—A form of transmitter employed in duplex telegraphy for readily reversing the direction of the main battery so as to send signals to the line.

**Battery Solution.**—The exciting liquid or electrolyte of a primary or secondary cell.

**Battery Stand.**—The insulating or insulated stand provided for holding a primary or secondary battery.

**Battery Syringe.**—A syringe for either removing the acid or spent liquids from a voltaic battery, or for introducing fresh liquid.

**Battery System for Electric Railroads.**—A system for the propulsion of street cars by means of storage batteries.

**Battery Transformer.**—A step-up transformer so wound as to be readily operated

- by a primary battery of a few series-connected cells.
- Battle Circuit.**—A circuit on a warship, connected with the conning tower and provided for use during action.
- Battle Lantern.**—A form of safety lantern for use in action on board a warship.
- Bead Areometer.**—A form of hydrometer suitable for rapidly testing the density of the exciting liquid in a storage cell.
- Bead Chain.**—A chain of metallic beads sometimes employed for the pull in a pendant electric-burner.
- Bead Hydrometer.**—A bead areometer.
- Bead Lightning.**—A form of lightning discharge in which the flashes produce a discontinuous line of light possessing a bead-like appearance.
- Beaded Cable.**—A form of cable employed for high-tension transmission, provided with a sheathing of strung porcelain beads.
- Bec-Carcel.** The carcel, a French photometric standard.
- Becquerel Radiation.**—An invisible radiation, discovered by Becquerel, emitted by certain salts, especially those of uranium, capable both of penetrating many media opaque to ordinary light, and affecting a photographic plate.
- Becquerel Rays.**—Becquerel radiation.
- Bed-Plate of Dynamo-Electric Machine.**—The base or frame of a dynamo-electric machine.
- Bega.**—A prefix for a billion, one thousand million, or  $10^9$ .
- Begadyn.**—One billion dynes, or roughly, the earth's gravitational force on a ton of matter.
- Beg-Erg.**—One billion ergs; or, 73.7 foot-pounds, approximately.
- Beg-Ohm.**—One billion ohms, or one thousand megohms.
- Begohm Galvanometer.**—A galvanometer which gives unit deflection through a resistance of one begohm in circuit with one volt.
- Bell Box.**—In telephony a box containing or designed to contain a telephone bell.
- Bell Hanger's Joint.**—A careless form of telegraphic or telephonic joint in which the ends of the wires are merely looped into each other.
- Bell Mouth of Cable Tank.**—A circular aperture provided in the top of a cable tank, through which a cable is led into or taken out of the tank.
- Bell Pull, Electric.**—Any circuit-closing device operated by a pull.
- Bell-Shaped Magnet.**—A modified form of horse-shoe magnet in the form of a split tube, and in which the approached poles are semi-circular in shape.
- Bell Switch.**—A switch connected with a telephone alarm-bell for the purpose of throwing it in or out of circuit.
- Belt Circuit.**—A series lighting circuit extending in the form of a wide loop, belt, or circle, as opposed to a circuit formed of two closely associated parallel wires.
- Belt-Driven Generator.**—A generator driven by means of belting, as distinguished from a direct-driven or rope-driven generator.
- Belt-Driving or Coupling.**—Driving or coupling by means of belts.
- Belt, Electric.**—A belt suitably shaped so as to be capable of being worn on the body, consisting either of imaginary or real voltaic or thermo-electric couples, and employed for its alleged therapeutic effects.
- Belt of Current.**—The total current generated by an armature at any moment, assumed as making a single turn around the armature.
- Belt Speed.** The velocity of translation or linear speed of a belt in the transmission of power.
- Bessel's Functions.**—A series of mathematical functions often connected with problems in electricity and satisfying a certain relation first enunciated by Bessel in connection with an astronomical problem.
- Bias of Relay Tongue.**—A term employed to signify such an adjustment of a polarized relay that on the cessation of a working current the relay tongue shall always rest against the insulated contact, and not against the other contact, or *vice versa*.
- Bichromate Voltaic Cell.**—A zinc-carbon couple employed with a solution of bichromate of potash and sulphuric acid in water.
- Bicro.**—A prefix for one billionth, one thousand millionth, or  $10^{-9}$ .
- Bicro-Ampere.**—The billionth of an ampere.
- Bicro-Farad.**—The billionth of a farad.
- Bicro-Henry.**—The billionth of a henry.
- Bicron.**—A unit of length equal to the billionth of a metre, and indicated by the symbol *mu*.

**Bicycle Car.**—An electrically propelled car whose weight rests on a single rail, and which is kept in position by a guide rail supported vertically above the main rail.

**Bicycle Electric Lamp.**—An incandescent lamp suitable for use on a bicycle and usually operated by a small voltaic battery.

**Biilar Control of Galvanometer Needle.**—The control of a galvanometer needle whereby it returns to its position of rest, on the removal of the deviating force, by the operation of a bifilar suspension.

**Bifilar Suspension.**—Suspension by means of parallel vertical wires or fibres as distinguished from suspension by a single wire or fibre.

**Bifilar Winding.**—The method of winding employed in resistance coils to obviate the effects of self induction, in which the wire instead of being wound in one continuous length, is doubled on itself before winding.

**Bight of Cable.**—A single loop or bend of cable.

**Bimetallic Accumulator.**—An accumulator or storage cell whose positive and negative plates are formed respectively of two different metals.

**Bimetallic Helix.**—A compound helix of two metals of different expansibilities, such as copper and steel, firmly riveted or soldered together, so that the helix is twisted or moved in one direction by unequal expansion, and in the opposite direction by unequal contraction.

**Bimetallic Thermometer.**—A thermometer whose operation depends on the expansion and contraction of a bimetallic helix.

**Bimetallic Thermostat.**—A form of thermostat employed for opening or closing a circuit by the expansions and contractions of a bimetallic arc-shaped spring.

**Bimetallic Wire.**—A compound telephonic or telegraph wire consisting of a steel core and a copper envelope, suitable for long-span overhead construction.

**Binary Compound.**—A compound formed by the union of two different elements.

**Binding Coils.**—Coils of wire, wound on the outside of the armature coils and at right angles thereto, to prevent the loosening of the armature coils during rotation by centrifugal force.

**Binding Post.**—A metallic binding screw, rigidly fixed to some apparatus or support,

and employed for conveniently making firm electric connections.

**Binding Screw.**—A name sometimes applied to a binding post.

**Binding Wire for Telegraph Lines.**—(1) The wire employed for securing a telegraph wire to the insulator which supports it. (2) A tie wire.

**Binnacle Compass.**—A compass on board ship placed in a binnacle for use in steering or directing the vessel.

**Biograph.**—An apparatus for obtaining on a screen, from a rapid succession of suitable pictures, the appearance of the actual movements of natural objects.

**Bioplasm.**—(1) Any form of living matter possessing the power of reproduction. (2) Living protoplasm.

**Bioscope.**—A biograph.

**Bioscopy, Electric.**—The determination of the presence of life or death by the passage of electricity through the nerves or muscles.

**Bipolar.**—Having two poles.

**Bipolar Armature.**—An armature suitable for use in a bipolar field.

**Bipolar Armature-Winding.**—Any armature winding suitable for use in a bipolar field.

**Bipolar Bath.**—An electro-therapeutic bath, the current supplied to which enters at one part of the bath-tub and leaves at another.

**Bipolar Dynamo-Electric Machine.**—A dynamo-electric machine with a bipolar field.

**Bipolar Generator.**—A bipolar dynamo-electric machine.

**Bipolar Magnetic Field.**—A magnetic field formed by two opposite magnetic poles.

**Bird Cage, Electric.**—A bird-cage-shaped wire screen employed by Hertz in his investigations on the propagation of electromagnetic waves for screening the spark micrometer.

**Bird Cage.** In submarine cable-work, a mechanical distortion of the sheathing in which the wires are locally bulged outwards leaving the serving or core visible or exposed.

**Birmingham Wire Gauge.**—An English wire gauge.

**Bismuth Spiral.**—A flat spiral of bismuth wire employed for the measurement of strong magnetic fields.

**Bi-Telephone.**—A term sometimes applied to a double telephone receiver ar-



ranged so as to permit the ready application of both ears of the listener to the receiving instruments.

**Bivalent.**—(1) Possessing an atomicity or valency of two. (2) Divalent.

**Bitite.**—A variety of insulating material.

**Black Electro-Metallurgical Deposit.**—A dark electro-metallurgical deposit that is thrown down from the metal in a plating bath when too strong a current is employed.

**Black Lead.**—Plumbago or graphite.

**Black Leading Machine for Electro-Typos.**—A machine for covering the printing surface of the wax impression employed in electro-typing with an electrically conducting surface of black lead.

**Black Light.**—Non-luminous radiation.

**Blake Telephone Transmitter.**—A form of carbon telephone transmitter.

**Blank Panel.**—A panel on a switchboard provided for the support of extra circuit connections or instruments.

**Blasting, Electric.**—The electric ignition of powder or other explosive material in a blast.

**Blavier's Formulæ.**—The formulæ employed in the Blavier test.

**Blavier's Test.**—A test introduced by Blavier, for localizing a single fault in a single telegraph line or conductor, by measuring the resistance at one end of the line, when the other end is successively freed and earthed.

**Bleaching, Electric.**—A bleaching process in which the bleaching agents are liberated as required by electrolytic decomposition.

**Block.**—To stop or check by means of a block system.

**Block-Facing.**—In a system of electric distribution means a section of conductors extending in front of a city block-facing.

**Block System for Railroads.**—A system for avoiding the collision of moving railroad trains, by dividing the road into a number of separate blocks or sections of a given length, and so maintaining telegraphic communication between towers located at the ends of each of such blocks, as to prevent, by the display of suitable signals, more than one train or engine from being on the same block at the same time.

**Block Wire.**—The line or wire employed in block systems for railroads connecting each block tower with the next tower on each side of it.

**Blooms.**—Masses of wrought or cast metal, generally rectangular in shape and approximately six inches square and three or four feet in length, from which wires are obtained by rolling.

**Blow.**—To melt or fuse a safety fuse.

**Blow-Pipe, Electric.**—A blow-pipe in which the air-blast is obtained by a convective electric discharge.

**Blower, Electric.**—An electrically driven blower.

**Blowing a Fuse.**—The fusion or volatilization of a fuse wire or safety strip by the current passing through it.

**Blowing Point of Fuse.**—The current strength at which a fuse blows or melts.

**Blue Magnetic Pole.**—A term sometimes employed for the south-seeking magnetic pole.

**Bluestone Gravity Cell.**—A voltaic cell consisting of a zinc-copper couple whose elements are immersed respectively in electrolytes of zinc sulphate and copper sulphate.

**Board of Trade Unit.**—(1) A unit of electric supply, or the energy contained in a current of 1,000 amperes flowing for one hour under a pressure of one volt. (2) A kilowatt-hour.

**Boat, Electric.**—An electrically propelled boat.

**Bobbed.**—A word employed to characterize a surface that has been polished by the action of a hob.

**Bobbin, Electric.**—A coil of insulated wire suitable for the passage of an electric current for any purpose, as, for example, energizing an electro-magnet.

**Body-Protector, Electric.**—A device for protecting the human body against the accidental passage through it of an electric discharge.

**Boiler-Feed, Electric.**—A device for electrically opening a boiler-feed apparatus when the water in the boiler falls to a certain predetermined point.

**Boiling of Secondary or Storage Cell.**—A term sometimes applied to the gassing of a storage cell.

**Bole.**—A unit of momentum, proposed by the British Association, equal to one gramme-kine.

**Bolognian Stone.**—A name formerly given to a calcareous substance that becomes phosphorescent on exposure to light.

**Bolometer.**—(1) An apparatus for electrically measuring small differences of temperature. (2) A fine wire or thin strip



of metal whose resistance is altered by incident radiant energy.

**Bolometric Spectrum.**—The luminous and non-luminous spectrum obtained by the use of a rock-salt prism, or a diffraction grating, for the measurement of radiation in the bolometric spectrometer.

**Bolometric Spectrometer.**—A spectrometer designed for the measurement of radiation, luminous or otherwise.

**Bolt.**—A lightning discharge.

**Bombardment, Electric.**—Molecular bombardment.

**Bombardment Incandescent Lamp, Electric.**—An electric lamp in which refractory material is rendered incandescent by molecular bombardment produced by the passage of an electric discharge through a rarefied space.

**Bonded Rails.**—In any electric system where the rails are used as a part of the circuit, as in a trolley system, rails connected at their joints by suitable bonds for the purpose of bringing them into good electric contact with one another.

**Bonding Resistance of Rail.**—The resistance offered in a rail circuit at the bonded joints.

**Bonsalite.**—An insulating substance.

**Bony Current.**—The electric current resulting from the difference of potential existing between the different parts of a bone in a recently killed animal.

**Booster.**—A dynamo, inserted in a special feeder or group of feeders in a distribution system, for the purpose of raising the pressure of that feeder or group of feeders, above that of the rest of the system.

**Boreal Fluid.**—A term formerly applied to the fluid that was supposed to exist around, or to emanate from, the boreal pole of a magnet.

**Boring, Electric.**—Forming holes in metals or minerals by the heat of the voltaic arc.

**Bot.**—A contraction sometimes used for Board of Trade unit of electric supply, or the kilowatt hour.

**Boucherize.**—To subject to the boucherizing process.

**Boucherizing.**—A process for preserving wooden telegraph poles, or railroad sleepers, by injecting a solution of copper sulphate into the pores of the wood.

**Bougie-Decimale.**—(1) The standard French candle. (2) A standard of luminous intensity equal to the 1-20th of that of the Violle molten-platinum standard.

**Bougie-Metre.**—A unit of illumination

equal to the normal illumination from a bougie-decimale at the distance of one metre, sometimes called a lux.

**Bound Charge.**—The condition of a charge on a conductor placed near another conductor, but separated from it by a medium through which electrostatic induction can take place.

**Bow Gear.**—The gear placed at the bow of a cable ship for the ready handling of a cable or the ropes used in cable work.

**Box Balance.**—A box form of electric bridge.

**Box Bridge.**—A commercial form of electric bridge or balance in which both the arms of the bridge and the known resistances consist of standardized resistance coils placed in a suitable box.

**Box-Sounding Relay.**—A relay whose magnet is surrounded by a resonant case of wood, for the purpose of increasing the intensity of the sounds made by the armature of the magnet.

**Boxing the Compass.**—Naming consecutively all the different points or rhumbs of a compass from any one of them.

**Bracket-Arm.**—An arm supported by a bracket for carrying a line insulator.

**Bracket-Arm Hanger.**—A hanger for an overhead trolley line supported on a bracket arm.

**Bracket Pole.**—In a system of overhead wires, a pole employed for the support of the brackets provided for the suspension of the overhead wires or conductors.

**Bracket Suspension-Ear.**—A trolley car supported on a bracket arm, designed for the suspension of an overhead trolley wire.

**Brake Arm.**—An arm or lever connected with the brake shoe, and by which the brake power is applied.

**Brake Disc.**—An electro-magnet in the form of a disc, employed in an electric street-car brake.

**Brake Handle.**—A handle projecting above the dasher of a car for the operation of the hand brake mechanism.

**Brake Shoe.**—A mass of metal whose outline conforms to the tread of a car wheel, which is pressed against the circumference of the wheel on the operation of the brake mechanism, for the purpose of stopping the car.

**Braided Wire.**—A wire covered with a braiding of insulating material.

**Branch.**—(1) In a system of parallel distribution, any conductor from which outlets

are taken or taps made. (2) One of the divisions of a divided conductor.

**Branches.**—(1) Conductors connected to the submains or supply conductors in a system of incandescent lighting. (2) Wires tapped to mains.

**Branch Block.**—A porcelain block provided with suitable grooves in which the terminals or conductors are placed for connecting a pair of branch wires to the mains.

**Branch Box.**—A box containing a branch block.

**Branch Circuits.**—(1) Additional circuits provided at points of a circuit where the current branches or divides, part of the current flowing through the branch, and the remainder flowing through the original circuit. (2) A shunt circuit.

**Branch Conductor.**—(1) A conductor placed in a branch or shunt circuit. (2) A smaller or sub-conductor tapping a main.

**Branch Coupling Box.**—In a system of street mains a coupling box suitable for connecting a house service connection with the incandescent mains supplying the house.

**Branch Cut-Out.**—A safety fuse or cut-out, inserted between a pair of branch wires and the mains supplying them.

**Branch Fuse.**—A branch cut-out or safety fuse.

**Branch of Multiple Circuit.**—Any of the separate circuits that are connected between the mains in a multiple circuit.

**Branch Point of Circuit.**—Any point of a circuit from which a branch is taken off.

**Branch-Wire Terminal Telephone Switchboard.**—A three-wire multiple switchboard for a telephone in which the jacks for any one subscriber are connected in successive panels in parallel instead of in series.

**Branched Magnetic Circuit.**—A magnetic circuit in which the flux subdivides into a number of separate magnetic circuits.

**Branched Series.**—A term sometimes employed for series-multiple.

**Branching Boards.**—Multiple telephone switchboards connected on the branching or multiple system.

**Branching Telephone System.**—(1) A system of multiple telephone switchboards employing the branching or three-wire switchboard. (2) A system of multiple telephone switchboard in which the vari-

ous jacks on one line are connected in parallel instead of in series.

**Branding, Electric.**—The process whereby a branding tool is heated to incandescence by an electric current instead of by ordinary means.

**Bread-and-Butter Cable.**—A name given to a form of light submarine cable in which the sheathing consists alternately of yarns and wires.

**Breadth Coefficient of Armature Coil.**—The ratio of the effective electromotive force induced in an armature coil to the effective electromotive force which would be induced if the coil had no breadth, i. e., if all its wire could be compressed into the space occupied by a single turn.

**Breadth of Coil.**—The angular distance to which a coil extends circumferentially around an armature core.

**Break.**—Any lack of conducting continuity in a circuit.

**Break-Down Switch.**—A panel switch employed in small three-wire systems, for connecting the positive and negative bus-bars so as to convert the system into a two-wire system, and thus, in case of a break down, to permit the system to be supplied with current from a single dynamo.

**Break-Induced Current.**—(1) The current induced in an active circuit by breaking or opening that circuit. (2) The current induced in a secondary circuit on the breaking of the circuit of the primary.

**Break Key.**—A key which opens or breaks the circuit when depressed.

**Break Shock.**—A term sometimes employed in electrotherapeutics for the physiological shock produced on the opening or breaking of an electric circuit.

**Break Signal.**—In telegraphy a name given to the signal which separates the preamble from the text of a message, or the text from the signature.

**Breaking Capacity of Switch.**—The strength of current which can be safely and effectively interrupted by a switch, as distinguished from the carrying capacity of the same.

**Breaking Down of Dielectric.**—Such a weakening of a dielectric subjected to electric pressure as permits disruptive discharges to pass through its substance.

**Breaking Down of Insulation.**—The failure of an insulating material, as evidenced by the disruptive passage of an electric discharge through it.

**Breaking In.**—(1) An interruption in the sending of a telegraphic despatch by an intermediate operator who endeavors to simultaneously use the line. (2) Introducing a key into a telegraph circuit by opening its switch. (3) Interrupting the continuity of a circuit.

**Breaking the Primary.**—Opening or breaking the circuit of the primary of an induction coil or transformer.

**Breaking Weight of Wire.**—The weight required to be hung on the end of a wire in order to break it.

**Breast Plate.**—The breast support for the microphone transmitter of a central telephone station operator.

**Breast Telephone Transmitter.**—A telephone transmitter supported for convenience on a plate placed on the breast of the operator.

**Broath Figures, Electric.** Faint figures of condensed vapor produced by electrifying a coin or other conducting object, placing it momentarily on the surface of a clean, bright, glass sheet, and then breathing gently on the spot where the coin was placed.

**Breeze, Electric.**—A brush discharge employed in electrotherapeutics.

**Breguet's Manipulator.**—A sending instrument employed by Breguet in his system of step-by-step, or dial telegraphy.

**"Bridge."**—A word sometimes employed for multiple-arc.

**Bridge Arms.**—The arms of an electric bridge or balance.

**Bridge Balance of Telegraph Line.**—Such a balance of a duplexed telegraph line, obtained by an electric bridge, in which the home relay ceases to respond to the home key.

**Bridge Duplex.**—The bridge method of duplex telegraphy, as distinguished from the differential method.

**Bridge, Electric.**—(1) A device whereby an unknown electric resistance is readily measured. (2) A device for measuring an unknown resistance by comparison with two fixed resistances and an adjustable resistance.

**Bridge Method of Duplex Telegraphy.**—(1) A system whereby two telegraphic messages can be simultaneously transmitted over a single wire in opposite directions, when a bridge balance of the line has been obtained. (2) A system of duplex telegraphy by means of a single-bridge duplex system.

**Bridge of a Fuse.**—A small gap at a fuse

in a metallic circuit filled with a semi-conducting compound in which heat is developed by a current.

**Bridge System of Quadruplex Telegraphy.**—A system of quadruplex telegraphy by means of a bridge duplex system.

**Bridges.**—Heavy copper wires suitably shaped for connecting a dynamoelectric machine in an incandescent lighting station to the bus-bars.

**Bridge-Wire.**—The wire in a Wheatstone's Bridge in which the galvanometer is inserted.

**Bridge with Secondary Conductors.** A form of Wheatstone bridge employing an additional pair of resistances, and suitable for measuring very low resistances.

**Bridging Bell.**—A polarized electric bell permanently connected across the circuit employed in the bridging-bell system of telephony.

**Bridging-Bell Telephone System.**—A system of telephone communication in which the call bells are placed in multiple-arc, permanently bridging the two line conductors of metallic circuits, or lagged to the ground in grounded circuits, so that, when a call is sent out, every bell in the line rings, the particular station needed being indicated by a suitable code of signals.

**Bridging Coils.**—In telephony, coils which are connected across a telephone circuit, as distinguished from coils placed in series in the circuit.

**Bridging Indicator.**—In telephony, an indicator connected in shunt across a circuit instead of in series.

**Bridging Relay.**—In telephony or telegraphy, a relay which is connected in shunt across a circuit instead of in series.

**Bridle Chain.**—In submarine cable work, the chain on a buoy which is connected to the buoy rope, and by which the buoy rope may be picked up, when the buoy is released at the slip chain.

**Bridle Wires.**—(1) Wires connecting the separate line wires with a cable box or tower. (2) Wires for looping a telegraph station into a line or lines.

**Bright Deposit.**—In the electroplating of silver a bright surface of deposited metal produced by a special final process in the plating.

**Bright Dipping.**—Cleansing a metal surface by dipping it in acid liquids for the purpose of ensuring a bright electro-metallurgical coating.



**Bright Dipping Liquid.**—The liquid employed in bright dipping.

**Brilliance of Light.**—(1) The brightness of a luminous source. (2) The quantity of light that is emitted normally from unit surface of a luminous source. (3) The intrinsic intensity of a luminous source.

**Britannia Joint.**—A telegraphic or telephonic joint in which the ends of the wires are laid side-by-side, bound together, and subsequently soldered.

**British Association Unit.**—A term formerly applied to the British Association unit of resistance or ohm.

**Broiler, Electric.**—An electrically heated broiler.

**Broken Circuit.**—(1) An open circuit. (2) A circuit whose electric continuity has been disturbed, and through which the current has, therefore, ceased to pass.

**Brother-in-Law.**—A bell whose sound is the same as that of the car indicator, concealed by a dishonest conductor for the purpose of avoiding ringing the bell of the car indicator when a fare has been collected.

**Brush-and-Spray Discharge.**—A streaming form of high-potential discharge possessing the appearance of a spray of silvery white sparks, or of a branch of thin silvery sheets around a powerful brush, obtained by increasing the frequency of the alternations.

**Brush Contact-Surface.**—(1) That portion of a commutator surface which is in contact with the brushes at any moment of time. (2) The surface area of a brush applied to a contact surface.

**Brush Discharge.**—The faintly luminous discharge which takes place from a positively charged pointed conductor.

**Brush Electrode.**—A conducting brush-shaped electrode employed in electrotherapeutic treatment.

**Brush-Holder Cable.**—A stranded conductor or cable employed in a dynamo or motor for direct connection to the brushes.

**Brush Holders for Dynamo-Electric Machine.**—Devices for supporting the collecting brushes of a dynamo-electric machine.

**Brush Pressure.**—(1) The electric pressure at the brushes of a dynamo-electric machine. (2) Mechanical pressure on a brush.

**Brush Rocker.**—In a dynamo or motor any device for shifting the position of the brushes on the commutator cylinder.

**Brush Shifting Device.**—A modified form of brush rocker.

**Brushes of Dynamo-Electric Machines.**—Strips of metal, bundles of wire or wire gauze, slit plates of metal, or plates of carbon, that bear on the commutator cylinder of a dynamo, and carry off the current generated.

**B-Side of Quadruplex Table.**—That side of a quadruplex table which is worked by means of strengthened currents.

**Bucking.**—A term employed in the operation of street-railway passenger cars for a sudden stopping of the car as if by a collision, due to opposition between two motors.

**Buckled Diaphragm.**—A fault in a telephonic transmitter or receiver due to a dent or warping in the diaphragm.

**Buckling.**—The warping or irregularities produced in the surface of the plates of storage cells by a too rapid discharge.

**Buffing.**—Preparing surfaces for the reception of electro-plating by subjecting them to the polishing action of a revolving wheel covered with a buff, on the surface of which rouge has been spread.

**Bug.**—(1) A term employed in quadruplex telegraphy to designate any fault in the operation of the apparatus. (2) Generally, a fault in the operation of any electric apparatus. (3) A particular fault or difficulty in quadruplex telegraphy consisting of an interference between the A and B-sides.

**Bug-Trap.**—A device employed to overcome the bug in quadruplex telegraphy.

**Building-Iron.**—A heated iron tool by means of which the mould impressed by a printed page, which it is desired to electro-type, is built up preparatory to its being placed in the plating bath.

**Building Knife.**—A heated knife-shaped tool employed in removing the wax that has been forced up around the sides of the matrix during the taking of the impression.

**Building Process for Electro-Type Metals.**—A process for bringing up the blank spaces in the mould of an electro-type by the addition of wax plates melted into place by the building-iron, the high spaces thus built-up becoming depressions in the finished plate.

**Building Switch.**—A switch provided with an insulating handle for cutting a building in or out of an electric circuit, usually, a series circuit.

**Building Tool.**—A form of building iron.



**"Building-Up" of Dynamo.**—The action whereby a dynamo-electric machine rapidly reaches its maximum E. M. F. after starting.

**"Built-In" Underground Conductor.**—An underground conductor which, instead of being placed in the duct of a conduit or tube so as to be capable of removal therefrom, at any time, is permanently "built in" or surrounded by the insulating and protective material.

**"Built-Up" Magnet.**—A composite permanent magnet.

**Bullet Probe.**—A probe containing electrical conductors, so arranged that the contact of the probe with a bullet closes an electric circuit and operates an electric signal.

**Bunched Cable.**—A cable containing more than a single wire or conductor.

**Bunsen Screen.**—The screen of a Bunsen or transducent-disc photometer.

**Bunsen Voltaic Coll.**—A zinc-carbon couple whose elements are immersed respectively in electrolytes of dilute sulphuric and strong nitric acids.

**Buoy, Electric.**—A buoy on which electrically produced luminous signals are displayed.

**Burette.**—A graduated glass tube employed for readily measuring the volume of a liquid.

**Burglar-Alarm, Electric.**—An electric device for automatically announcing the opening of a door, window, closet, drawer or safe, or the passage of a person through a hallway, or on a stairway.

**Burglar-Alarm Annunciator, Electric.**—An annunciator used in connection with a system of burglar-alarms.

**Burglar-Alarm Contacts.**—Contacts fitted to windows, doors, tills, safes, floors, etc., so that the movements of the various parts from their natural positions, sound an alarm.

**Burglar-Alarm Matting.**—A matting provided with a number of invisible contacts connected with an alarm bell, whose circuits are closed by treading on the matting.

**Buried Cable or Conductor.**—An underground cable or conductor placed directly in the earth, in contradistinction to one placed in a conduit or subway.

**Buried Transformer.**—A transformer, provided with a water-tight cover and placed below the surface of the ground.

**Burn-Out.**—The destruction of an armature, or any part of an electric apparatus,

by the passage of an excessive current due to short-circuit or other cause.

**Burned-Out Incandescent Lamp.**—An incandescent lamp which through continued use is no longer able to furnish electric light.

**Burner, Electric.**—A gas-burner that is capable of being electrically lighted.

**Burnetize.**—To subject to the burnetizing process.

**Burnetizing.**—A method adopted for the preservation of wooden telegraph poles, by injecting a solution of zinc-chloride into the pores of the wood.

**Burning at Commutator of Dynamo.**—An arcing at the brushes of a dynamo-electric machine, due either to their imperfect contact or improper position, resulting in the loss of energy to the circuit, and the destruction of the commutator segments, or of the brushes.

**Burnishing.**—A process by means of which surfaces are prepared for electroplating by subjecting them to the action of burnishing tools.

**Burnt Electro-Metallurgical Deposit.**—The black deposit of metal which is thrown down when the intensity of the depositing current is too strong.

**Bus.**—A word generally used instead of omnibus.

**Bus-Bar Connectors.**—Connectors employed for connecting or joining the ends of bus-bars.

**Bus-Bar Stand.**—A bus-bar support on a switchboard.

**Bus-Bar Voltmeter.**—A voltmeter employed in a central station for measuring the pressure between the bus-bars.

**Bus-Bars.**—Heavy bars of conducting metal connected directly to the poles of one or more dynamo-electric machines, and, therefore, receiving the entire current produced by the machines.

**Bus Field-Excitation.**—Excitation of the field of a generator by current taken directly from the bus-bars.

**Bus-Rods or Wires.**—Terms frequently used for bus-bars.

**Bushing of Socket.**—A sleeve or cylinder of insulating material inserted at the entrance of a lamp socket for the protection of the entering conductors.

**Busy Back.**—A jack at a central telephone exchange connected with a battery and vibrator, in such a way that the operator by inserting the plug of an incoming line into this jack can notify a calling operator that the subscriber desired is busy.

**Busy Test.**—A simple test whereby a telephone operator at a multiple switchboard can readily tell whether any wire or circuit connected with the switchboard is or is not in use at any moment of time.

**Butt Joint.**—(1) An end-to-end joint. (2) A joint effected in wires by placing the wires end on and subsequently soldering or welding them.

**Butt Prop.**—A tool sometimes called a "dead man," used in the erection of telegraph poles.

**Button Repeater.**—A manual telegraphic repeater whereby the proper connections

are made for repeating a message in either direction, by turning a button.

**Buzzer, Electric.**—(1) A call, not as loud as that of an electric bell, employing a humming sound by the use of a sufficiently rapid automatic contact-breaker. (2) A telephone receiver for morse circuits employing a vibrating contact key.

**Buzzing of Bell.**—An improper action of an electric bell, whereby it produces a buzzing sound instead of its proper ringing.

**By-Pass of Discharge.**—A term sometimes employed for alternative path.

## C

**C.**—A contraction for Centigrade.

**C.**—A contraction for current.

**C.**—A symbol for capacity. (Partly international usage.)

**C.**—A symbol for coulomb.

**C. E. M. F.**—A contraction for counter electromotive force.

**C. G. S.**—A contraction for centimetre-gramme-second.

**c. c.**—A contraction for cubic centimetre, the C. G. S. unit of volume.

**cm.**—An abbreviation for centimetre, the C. G. S. unit of length.

**cm<sup>2</sup>.**—An abbreviation for square centimetre, the C. G. S. unit of surface.

**cm<sup>3</sup>.**—An abbreviation for cubic centimetre, the C. G. S. unit of volume.

**C. M. M. F.**—A contraction for counter-magnetomotive force.

**C. P.**—A contraction for candle-power.

**C. R.**—A contraction for conductor-resistance.

**C-R Activity.**—(1) The I<sup>2</sup>R activity. (2) That portion of the electric activity which is expended in heating the conductor, and due to the ohmic resistance offered by the conductor to the passage of the current. (3) The thermal activity of a circuit expressed in watts, and equal to the square of the current strength in amperes multiplied by the resistance in ohms.

**C-R Loss.**—The loss of energy in a conductor due to the ohmic resistance and the current strength.

**C. G. S. Units.** The centimetre-gramme-second units.

**Cabinet Seat Contact.**—A contact placed in a silence telephone cabinet, underneath a seat, and closed by the weight of a person on the seat.

**Cable.**—(1) An electric cable. (2) A message transmitted by means of an electric cable.

**Cable.**—To send a telegraphic despatch by means of a cable.

**Cable Alphabet.**—The code or telegraphic alphabet employed in cable signalling.

**Cable Box.**—A box provided for the reception and protection of a cable head.

**Cable Buoy.**—A buoy generally secured by a mushroom anchor and provided for temporarily holding or securing an end of a cable during its laying or repair.

**Cable Casing.**—The metallic sheathing of a cable.

**Cable Coll.**—A voltaic cell formed by an exposed broken end of a submarine copper conductor and the iron sheathing of the cable.

**Cable Clearing-House System.** A system whereby every message sent over a submarine cable is returned to the head office and a comparison effected between the original message, as received for transmission, and the final message, as delivered to the addressee.

**Cable Clip.**—A term sometimes used for cable hanger.

**Cable Closing Machine.**—A machine for covering a cable with its sheathing.

**Cable Code.**—(1) A cable alphabet (2) A cable cipher.

**Cable Core.**—(1) The insulated conducting wires of an electric cable. (2) The electrically essential portion of a cable as distinguished from its sheath or protector.

**Cable Cross-Connecting Board.**—In a telephone exchange, where a number of cables enter the building from the outside, a distributing board, placed in a terminal room to facilitate the work that is

constantly going on of making and changing the connections of the subscribers' lines to the switchboard cables.

**Cable Currents.**—(1) Various currents that exist in a submarine cable and interfere with the testing, consisting of earth currents, electrostatic charge and discharge currents, and polarization currents due to a fault or break. (2) A current flowing through a cable in the absence of any impressed E. M. F. (3) The current which tends to flow in a broken cable from the exposed copper conductor at the fracture to the non-sheathing through the apparatus at the station.

**Cable Despatch.**—A despatch sent by means of a cable.

**Cable Drum.**—(1) In cable machinery, a drum on which cable is wound for coiling, shipping, laying, or turning over. (2) A drum or reel on which cable is wound for transport.

**Cable, Electric.**—A combination of an extended length of a single insulated electric conductor, or of two or more separately insulated electric conductors, covered externally with a metallic sheathing or armor.

**Cable Fault.** Any failure in the proper working of a cable due either to a total or partial fracture of the cable, or to a heavy electric leakage.

**Cable Float.**—A float employed for temporarily relieving the tension on a cable while it is being paid out.

**Cablegram.**—A telegraph message received by cable.

**Cable Grapple.** A heavy pronged iron hook provided for picking up a cable by strapping.

**Cable Grip.**—(1) The grip provided for holding the end of an underground cable while it is being drawn into a duct. (2) In a cable road the grip by means of which a car is driven by the moving cable.

**Cable Ground.**—The locality of a cable operation or repair.

**Cable Hanger.** A hanger or hook suitably secured to a cable and designed to sustain its weight by intermediately supporting it on an iron or steel wire strung above the cable.

**Cable Hanger Tongs.**—Tongs provided with long handles for attaching the hangers of an aerial cable to the suspending wire or rope.

**Cable Head.**—A rectangular board provided with binding posts and fuse wires

for the purpose of receiving the wires of overhead lines where they enter a cable.

**Cable House.**—A hut provided for securing and protecting the end of a submarine cable when it is landed.

**Cable Hut.**—A cable house.

**Cable Joint.**—An insulated electric connection made between the cores of two separate lengths of cable.

**Cable Junction-Box.**—A junction box for holding and protecting the insulated connections or joints between cables.

**Cable Laid-Up-in-Layers.**—A cable all of whose conducting wires are in layers.

**Cable Laid-Up-in-Reverse-Layers.**—A cable the alternate layers of whose conductors are twisted in opposite directions.

**Cable Laid-up-in-Twisted-Pairs.**—A cable every pair of whose wires is twisted together.

**Cable Land Line.**—(1) A land line composed of cable. (2) A land line connected to a cable.

**Cable Laying.**—The process of placing a cable on the sea-bottom.

**Cable Lead.**—A lead formed of a cable of several stranded conductors, as distinguished from a lead containing a single conductor.

**Cable Message.**—A cable despatch.

**Cable Office.**—An office connected with a cable.

**Cable Protector.**—(1) A device for the safe discharge of the charge induced in the metallic sheathing of a cable, or in the conductors surrounding or adjacent to the cables, consequent on changes in the electromotive force applied to the conducting core of the cable. (2) A fuse device provided for the protection of each of the wires of an aerial cable, placed in the cable head at the junction where an aerial line enters the cable head.

**Cable Rack.**—A rack placed at the back of a multiple telephone switchboard for supporting the cabled switchboard conductors and providing ready access to the same.

**Cable Repairing.**—The process of repairing a broken or faulty cable.

**Cable Resister.**—A form of float or buoy provided for lessening the strain on a cable while paying it out.

**Cable Road.**—A system of car propulsion in which the cars are drawn by the movement of an underground cable to which the moving cars are attached by a suitable grip.



**Cable Sending-Key.**—A key employed for readily sending the positive and negative current impulses required to transmit the cable alphabet or code.

**Cable Serving.**—A covering of hemp or jute spun around the insulated core of a cable in order to protect it from the pressure of the iron wire armor or sheathing of the cable.

**Cable Ship.**—A ship provided with the apparatus required for laying or repairing submarine cables.

**Cable Signals.**—Signals received over the circuit of a cable.

**Cable Speaking-Set.**—The apparatus used in signalling over a cable.

**Cable Spinning-Jenny.**—A device for readily binding an aerial cable to a supporting wire.

**Cable Splice.**—A connection between the sheathing or armor of two lengths of cable.

**Cable Stopper.**—A flexible grip applied to a cable to keep it from moving or slipping.

**Cable Suspender.**—A device for suspending an aerial cable.

**Cable Switchboard.**—A switchboard to which the cable conductors are connected.

**Cable Tank.**—A strong water-tight tank placed on a cable ship and provided for holding a coiled section of cable that is ready for laying.

**Cable Telegraph.**—A general term including all the apparatus employed in cable telegraphy.

**Cable Telegraphy.**—Telegraphic communication carried on over a submarine cable.

**Cable Terminal.**—A water-tight covering provided at the free end of a telephone cable to prevent injury to the cable's insulation by the moisture of the air.

**Cable Terminal-Pole.**—The terminal pole of an aerial line provided where the ends of an aerial line are connected with an underground cable for the support of the cable head.

**Cable Terminal-Switchboard.**—A board in a cable head where the wires are spread out and connected in proper order to a number of binding posts which in their turn are connected through fuse wires to binding posts receiving the ends of overhead wires.

**Cable Transformer.**—An alternating-current transformer in which the primary and secondary conductors have the

form of a cable overlaid by an iron sheath or magnetic circuit.

**Cable Vault.**—A vault provided in a building where cables enter from underground conduits, and where the cables are opened and connected to fusible plugs or safety catches.

**Cable Testing.**—The process or methods of trying or measuring the electric or mechanical capabilities of a cable.

**Cable Well.**—A cable tank.

**Cable Winder.**—A cable spinning-jenny.

**Cable Work.**—Any operation connected with the manufacture, shipping, laying, testing, or repair of cables.

**Cable Worming.**—A central core of hemp or jute around which are wrapped the several separate conductors of any cable that contains more than a single conductor.

**Cabled.**—Transmitted by means of cable telegraphy.

**Cabling.**—Transmitting by means of cable telegraphy.

**Cadmium Standard Cell.**—A standard voltaic cell of very low temperature coefficient of variation in E. M. F., employing a cadmium-zinc couple.

**Cage Lightning-Protector.**—A term sometimes employed for a lightning protector consisting of wires in the form of a cage surrounding the body to be protected.

**Calamine, Electric.**—A crystalline variety of silicate of zinc that possesses pyroelectric properties.

**Caloulagraph.**—A machine employed in long-distance telephony for registering the time during which the use of a line by a subscriber continues.

**Cal-Electric Generator.**—A generator whose operation depends on the production of electricity in the secondary coil of a transformer by changes of temperature in its iron core.

**Cal-Electricity.**—Electricity produced by changes of temperature in the iron core of a transformer.

**Calibrate.**—To determine the absolute or relative values of the scale divisions, or of the indications of any electrical instrument, such as a galvanometer, electrometer, voltmeter, wattmeter, or other similar instrument.

**Calibrating.**—Determining or marking off the values or readings of a galvanometer, electrometer, voltmeter, wattmeter, or other similar electrical instrument.

**Call.**—(1) In telephony, the signal or call of



a subscriber for connection to some other subscriber. (2) In telegraphy, the signal for attention, or the call for response from the distant operator.

**Call-Bell, Electric.**—An electric bell used to call the attention of an operator to the fact that his correspondent wishes to communicate with him.

**Call-Key.**—Any suitable key for sending an electric call.

**Callaud Voltaic Cell.**—A name sometimes given to the blue-stone gravity cell.

**Calling Circuit.**—In the Law system of telephony, a common calling-wire circuit connecting the central exchange through all the subscribers' offices in a given group, and employed for sending calls to the central office.

**Calling Drops.**—In an isolated-station switchboard, drops employed for indicating the particular subscriber calling.

**Calling Plug.**—That plug of a pair of plugs, at a central telephone switchboard, which is inserted in the jack of the subscriber wanted and through which that subscriber is called up.

**Calling Side of Telephone Circuit.**—That side of a telephone circuit over which a call arrives.

**Calling Station.**—Any station that desires to be placed in communication with another station.

**Calling Wire.**—A wire forming the calling circuit in a system of telephony.

**Call Signal.**—In telegraphy, the signal or group of signals indicating the particular station called.

**Call Wire.**—(1) A speaking wire. (2) A wire connecting two telephone exchanges, for the purpose of transmitting instructions, as distinguished from a wire employed for establishing communication between subscribers. (3) A wire employed for calling the attention of a central-station operator by a subscriber, as distinguished from the wires through which he communicates with other subscribers.

**Call-Wire Key.**—A subscriber's key employed to call the operator at a central telephone station.

**Call Wire Switchboard.**—A switchboard at a telephone station auxiliary to a multiple switchboard in a call-wire system, and employed for suitably dividing up call-wires among the operators, so as to equalize their work.

**Call-Wire System.**—A system of telephony in which special wires are em-

ployed to call the operator at the central station.

**Calorescence.**—The transformation of obscure heat rays into luminous rays on impact with certain solid substances.

**Caloric.**—A term formerly applied to the assumed fluid that was believed to be the cause or essence of heat.

**Calorie.**—(1) A heat unit. (2) The quantity of heat required to raise 1 gramme of water 1° centigrade.

**Calorific Intensity.**—The temperature attained in combustion.

**Calorimeter.**—An instrument for measuring the amount of heat contained in, or developed by, a given body.

**Calorimeter, Electric.**—An instrument for measuring the heat developed, in a given time, in any conductor, by an electric current.

**Calorimetric.**—Of or pertaining to the calorimeter.

**Calorimetric Conductivity.**—Specific heat transference, or the conductivity of a substance based on the quantity of heat transferred in a given time, independently of the temperature attained.

**Calorimetric Measurement.**—The measurement of heat energy by means of a calorimeter.

**Calorimetric Photometer.**—A photometer in which the light to be measured is absorbed by the face of a thermopile, and its photometric intensity estimated from the strength of the electric current thereby produced.

**Calorimetry.**—The art of measuring heat energy by means of a calorimeter.

**Calorimotor.**—(1) A deflagrator. (2) A word formerly employed for a number of series-connected voltaic cells. (Obsolete.)

**Calory.**—A less preferable orthography sometimes employed for caloric.

**Canalization.**—(1) A network of conductors. (2) A system of electric mains.

**Candle.**—(1) A unit of photometric intensity. (2) The photometric intensity which would be produced by a standard candle burning at the rate of two grains per minute.

**Candle Balance.**—A balance support provided for the standard candle of a photometer, so arranged as continuously to weigh the candle and so determine its rate of consumption while in use.

**Candle, Electric.**—A Jablotchkoff candle.

**Candle-Foot.**—A unit of illumination equal to that normally produced by a

standard British candle, at a distance of one foot, and sometimes called a lux.

**Candle-Power.**—(1) The intensity of light emitted by a luminous body estimated in standard candles. (2) The photometric intensity of one standard candle.

**Canopy.**—(1) In a multiple telephone exchange an overhanging frame suitably supported from above, and containing glass and drops. (2) An ornamental metallic covering employed in incandescent lighting for an electrolier or pendant outlet.

**Canopy Switch.**—An overhead switch placed at each end of a trolley car for the purpose of permitting the motorman to turn the current on or off the car as desired, when, for example, he wishes to inspect a fuse block or controller without pulling down the trolley pole.

**Cant Hook.**—A tool employed in the erection of telegraph poles consisting of a pole furnished with a curved pivoted hook employed for turning or rolling a telegraph pole.

**Caoutchouc.**—(1) A resinous substance possessing high powers of electric insulation, obtained from the milky juice of certain tropical trees. (2) India rubber.

**Cap Wire.**—An overhead wire carried on the summit of a pole, as distinguished from an overhead wire carried on a cross arm.

**Capability of Dynamo-Electric Machine.**—The maximum theoretical activity of a dynamo expressed by the square of its electromotive force divided by its resistance.

**Capacitance.**—(1) A term proposed in place of capacity. (2) The resistance of a condenser in an alternating-current circuit.

**Capacity Balance of Duplex System.**—The balance of capacity in duplex telegraphy as opposed to a balance of resistance.

**Capacity Circuit.**—A circuit containing capacity but no inductance.

**Capacity Current of Cable.**—(1) The current in a cable due to its capacity. (2) The charging or discharging current in a cable.

**Capacity Load.**—The apparent load or current of a high-tension generator due to the capacity of the distributing conductors as distinguished from the load or current usefully distributed.

**Capacity of Accumulator.**—The available output of a storage battery expressed either in ampere-hours, or in watt-hours.

**Capacity of Cable.**—(1) The quantity of electricity required to raise a given length of cable to a given potential, divided by the potential. (2) In a multiple cable, the amount of charge at unit potential which any single conductor will take up, the rest of the conductors being grounds. (3) The ability of a conducting wire or cable to permit a certain quantity of electricity to be passed into it before requiring a certain potential.

**Capacity of Cable Tank.**—The accommodation of a cable tank expressed either voluminally in cubic feet, or in relation to the number of miles of a given type of cable which can be practically stowed away in it.

**Capacity of Condenser.**—(1) The quantity of electricity a condenser is capable of holding in coulombs when charged to a pressure of one volt. (2) The ratio between the quantity of electricity in coulombs on charging of a condenser and the potential difference in volts between the two coatings.

**Capacity of Leyden Jar.**—The quantity of electricity a Leyden jar will take under unit difference of potential.

**Capacity of Line.**—The ability of a line to act as a condenser, and, therefore, to possess capacity.

**Capacity of Polarization of Voltaic Cell.**—The capacity of becoming polarized when subjected to a steady discharge.

**Capacity of Secondary or Storage Cell.**—The capacity of an accumulator.

**Capacity Pressure.**—(1) In a condenser connected with a source of alternating currents, a pressure in phase with the condenser current. (2) A pressure due to a capacity. (3) The pressure at the terminals of a condenser.

**Capacity Reactance.**—(1) The reactance of a condenser due to its capacity. (2) The condensance. (3) The capacitance.

**Capacity Resistance.**—(1) A term proposed for the resistance which a condenser or other substance possessing electric capacity offers to the passage of an alternating electric current. (2) The impedance of a condenser.

**Capillarity.**—The elevation or depression of liquids in tubes of small internal diameter.

**Capillary.**—Of small or hair-like diameter or size.

**Capillary Attraction.**—The molecular attractions concerned in capillary phenomena.

**Capillary Contact-Key.**—A form of fluid contact-key in which the circuit is closed or broken by means of a wire which is dipped into or removed from the surface of a mass of mercury.

**Capillary Electrometer.**—An electrometer in which difference of potential is measured by the movements of a drop of sulphuric acid in a tube filled with mercury.

**Capizing Thermometer.**—A thermometer employed in deep sea soundings for cable work, which is caused to record the temperature at the moment the lead commences to ascend from the bottom, by causing the thermometer to be reversed or capized.

**Car Annunciator.**—An annunciator placed in a car for the purpose of calling a waiter or porter.

**Car Barn.**—A covered shed provided with tracks in which trolley cars are stored when not in use.

**Car Body.**—The wooden framework of a street-railway car which encloses the space provided for the passengers.

**Car-Brake, Electric.**—A car-brake that is operated by the electric current produced by the motor acting as a generator when the current is turned off and the car is rapidly moving.

**Car-Brake Mechanism.**—The mechanism for applying the brake to a car-wheel.

**Car Controller.**—(1) A device placed at each end of the platform of a trolley car, under the control of the motor man for starting, stopping, reversing or changing the velocity of a trolley car. (2) A series-parallel car-controller.

**Car-Heater, Electric.**—An electric heater consisting essentially of suitably supported coils of insulated wire traversed by an electric current.

**Car-Lamp, Electric.**—An incandescent lamp generally provided with an anchored filament, suitable for use in street-railway cars.

**Car-Propulsion, Electric.**—The propulsion of cars by means of electric motors.

**Car Truck.**—The part of a car on which the car body rests.

**Car Wiring.**—The distribution of conductors on an electric street car.

**Carbon.**—An elementary substance which occurs naturally in three distinct allotropic forms: graphite, charcoal and the diamond.

**Carbon Arc.**—A voltaic arc formed between carbon electrodes.

**Carbon Brushes for Electric Motors or Generators.**—Plates of artificial carbon employed as the brushes of dynamos or motors.

**Carbon Button.**—A button-shaped carbon mass whose resistance varies with pressure.

**Carbon Cell.**—(1) A silvered plate of glass provided on its silvered side with a number of zigzag furrows filled with carbon soot, and employed as the receiving instrument in a photophone. (2) A voltaic cell employing carbon as one of its elements.

**Carbon Clutch or Clamp for Arc Lamps.**—A clutch or clamp attached to the lamp rod or the support of the positive or upper carbon of an arc lamp, provided for gripping or holding the carbon.

**Carbon Diaphragm of Telephone.**—A thin sheet of carbon employed as the diaphragm in certain forms of telephone transmitters.

**Carbon Electrodes for Arc Lamps.**—The carbons of an electric arc lamp between which the arc is maintained.

**Carbon Holder.**—A device employed in an arc lamp for supporting the lower or negative carbon.

**Carbon Megohm.**—A resistance of approximately one megohm composed of a thin film or strip of graphite.

**Carbon Motor Brush.**—A carbon brush employed on a motor.

**Carbon Pencils.**—A word sometimes used for the carbons employed in arc lamps.

**Carbon-Point Lightning-Arrester.**—A lightning arrester in which the disruptive discharge occurs between opposed carbon points.

**Carbon Points.**—The carbon rods or pencils employed in arc lamps.

**Carbon Rheostat.**—An adjustable resistance formed of carbon plates or powder whose resistance can be varied by pressure.

**Carbon Telephone Transmitter.**—A telephone transmitter whose operation is dependent on variations in the resistance of a carbon button, or of a mass of loose granulated carbon, on the to-and-fro movements of the diaphragm.

**Carbon Tongs.**—A pair of tongs suitable for gripping arc-light carbons.

**Carbon Transmitter.**—A carbon telephone transmitter.

**Carbons.**—A general term applied to the carbon or negative elements of voltaic cells.



**Carbonic Acid Gas.**—A gaseous substance formed by the union of one atom of carbon with two atoms of oxygen.

**Carboning Lamps.**—Placing carbons in electric arc lamps.

**Carbonizable.**—Capable of being carbonized.

**Carbonization.**—The act of carbonizing.

**Carbonize.**—To reduce a carbonizable substance to carbon.

**Carbonized Cloth Discs for High Resistance.**—Discs of cloth carbonized by heating to an exceedingly high temperature while out of contact with air.

**Carbonizer.**—Any apparatus suitable for reducing a carbonizable material to carbon.

**Carbonizing.**—Subjecting a carbonizable substance to the process of carbonization.

**Carbonizing Box.**—A box prepared for holding the carbon filaments of incandescent lamps during their carbonization.

**Carbonizing Frame.**—A suitably shaped block of carbon prepared for winding the cotton threads, or other plastic carbonizable material, employed for the filaments of incandescent lamps, before submitting them to the carbonizing process.

**Carcass of Dynamo-Electric Machine.**—A term sometimes used for the iron framework of a dynamo.

**Carcel.**—(1) A French photometric standard of light. (2) The light emitted by a lamp of definite dimensions burning 42 grammes of Colza oil in an hour, with a flame 40 millimetres in height.

**Carcel Lamp.**—An oil lamp employed in France as a photometric standard.

**Carcel Standard.**—The carcel.

**Carcel Standard Gas-Jet.**—A lighted gas jet employed for determining the candle-power of gas by measuring the height of a jet of gas, burning under certain conditions, when used in connection with the light of a larger gas-burner burning under similar conditions, for a photometric measurement of electric lights.

**Cardan Suspension of Compass Needle.**—The gimbal suspension of a compass needle.

**Cardew Voltmeter.**—A voltmeter whose indications are obtained by the expansion of a long fine wire by the passage through it of the current to be measured.

**Carnot's Cycle.**—A cycle of steps or operations proposed by Carnot for convenience in studying the transformation of heat into work.

**Carriers of Replenisher.**—The moving conductors of a replenisher which carry the charges and thus permit an accumulation of such charges.

**Carrying Capacity.**—The maximum current strength that any conductor can safely transmit.

**Carrying Capacity of Safety Fuse.**—The maximum current strength which a fuse wire or block can carry without melting.

**Carrying Hooks.**—A pair of curved hooks pivoted together and provided with handles, for carrying telegraph poles.

**Cascade Charging of Leyden Jars or Condensers.**—A method of charging Leyden jars or condensers by means of the electricity liberated by induction from one coating when a charge is passing into the other coating.

**Cascade Connection.**—A term sometimes employed for series connection.

**Cascade Connection of Condensers.**—A term sometimes employed for a series connection of condensers.

**Case-Hardening, Electric.**—Superficially hardening a piece of metal by means of electrically generated heat.

**Case Wiring.**—A wiring in which the electric conductors are held in place in the walls or ceilings of a room by means of continuous cleats.

**Casings.**—Grooves or panelled channels for carrying wires in a house.

**Cast Rail-Bond.**—A method for bonding the successive track rails, in a system of trolley propulsion, by casting molten iron around all except the upper portions of the joint.

**Casting, Electric.**—A process for casting metals, in which the metals are fused by means of heat of electric origin.

**Castor and Pollux Light.**—A term formerly used for the St. Elmo's fire.

**Catalisis.**—An objectionable orthography sometimes employed for catalysis.

**Catalysis.**—The influence produced on chemical combination or decomposition, by the presence of certain substances which, without undergoing any changes themselves, produce changes in the affinities of other substances by their mere contact or presence.

**Catalytic.**—Of or pertaining to catalysis.

**Cataphoresis.**—Electric osmose.

**Cataphoretic.**—Of or pertaining to cataphoresis.

**Cataphoretic Action.**—Cataphoretic medication or demedication.



- Cataphoretic Demedication.**—A means whereby material is removed from different parts of the body by means of cataphoresis.
- Cataphoretic Electrode.**—(1) An electrode containing in solution the drug or medication that is to be introduced into the body by cataphoresis. (2) The anode.
- Cataphoretic Medication.**—The introduction of a drug or medication into the body by means of cataphoresis.
- Cataphoric.**—Of or pertaining to cataphoresis.
- Cathelectrotonus.**—An orthography sometimes employed for cathelectrotonus.
- Catenary.**—A catenary curve.
- Catenary Curve.**—The curve described by the sagging of a wire, under its own weight, when stretched between two points of support.
- Cathelectrotonic.**—Of or pertaining to cathelectrotonus.
- Cathelectrotonic State.**—The condition of increased functional activity of a nerve in the neighborhood of the cathode to whose influence it is subjected.
- Cathelectrotonic Zone.**—A name sometimes given to the peripolar zone.
- Cathelectrotonus.**—In electro-therapeutics the condition of increased functional activity that occurs in a nerve in the neighborhood of the cathode or negative electrode.
- Cathetometer.**—An instrument for the accurate measurement of small heights or distances.
- Cathion.**—The electro-positive ion, atom, or radical into which the molecule of an electrolyte is decomposed by electrolysis.
- Cathodal.**—Of or pertaining to the cathode.
- Cathodo.**—(1) The conductor or plate of an electro-decomposition cell connected with the negative terminal of a battery or other electric source. (2) The terminal of an electric source into which the current flows from the electrolyte of a decomposition cell or voltmeter. (3) The electrode of a bath, tube, body, or device by which the current leaves the same. (4) The negative electrode.
- Cathode Cup.**—(1) A cup-shaped cathode of an X-ray tube. (2) A concave mirror attached to the cathode of an X-ray or other high-vacuum tube.
- Cathode Pictures.**—X-ray or Roentgen-ray pictures.
- Cathode Ray Spectrum.**—A succession of light and dark phosphorescent bands produced on a screen, in an exhausted Crookes tube, by magnetically deflected cathode rays.
- Cathode Rays.**—Radiation emitted from the cathode or negative electrode of a Crookes or X-ray tube.
- Cathodic.**—Of or pertaining to the cathode.
- Cathode Streams.**—Cathode rays.
- Cathodic Current.**—In a polarized voltaic couple immersed in acidulated water, the current produced by the agitation of the plate connected with the cathode.
- Cathodic Electro-Diagnostic Reactions.**—The reactions which occur at the cathode placed on or over any part of a living body.
- Cathodic Rays.**—The cathode rays.
- Cathodic Streamings.**—Cathode rays.
- Cathodogram.**—A Roentgen or X-ray picture.
- Cathodograph.**—A radiograph.
- Cation.**—An orthography sometimes employed for cathion.
- Catoptrics.**—That branch of optics which treats of the reflection of light.
- Cauterization.**—The act of cauterizing or burning with a heated, solid or caustic substance.
- Cauterization, Electric.**—Subjecting to cauterization by means of an electrically heated wire.
- Cauterize.**—To subject to cauterization.
- Cauterizer, Electric.**—A name sometimes given to an electric cautery.
- Cautery Battery.**—A term sometimes employed in electro-therapeutics for a multiple-connected voltaic battery adapted for producing incandescence for cautery effects.
- Cautery Cabinet.**—A cabinet containing a cautery battery, switchboard, cautery knives and other necessities for electric cauterization.
- Cautery Cell.**—A cell suitable for use in a cautery battery.
- Cautery, Electric.**—The application to the human body of variously shaped platinum wires, heated to incandescence by the electric current, for removing diseased growths, or for stopping hemorrhages.
- Cautery Knife-Electrode.**—A knife-shaped electrode that is rendered incandescent by the passage through it of an electric current.
- Coiling Block.**—An attachment fastened to the ceiling for suspending flexible

- cords, and connecting them with the supply wires of an incandescent system.
- Ceiling Board.**—An arc-light hanger board.
- Ceiling Bracket.**—(1) A ceiling canopy. (2) A bracket for supporting an insulated wire or wires to a ceiling.
- Ceiling Cut-Out.**—A cut-out placed in a ceiling block.
- Ceiling Fan.**—An electrically driven fan suspended from the ceiling.
- Ceiling Rose.**—An ornamental ceiling plate from which an electric conductor passes.
- Ceiling Rosette.**—An ornamental, rose-shaped ceiling block.
- Cell of Primary or Secondary Battery.**—A jar of a primary or secondary battery containing a single couple and its electrolyte.
- Celluloid Lamp-Filament.**—A lamp filament made by carbonizing celluloid, a modified form of cellulose.
- Celluvort Fibre.**—A variety of insulating material.
- Centi.**—A prefix for the one hundredth part.
- Centi-Ampere.**—The hundredth of an ampere.
- Centi-Ampere Balance.**—An ammeter in the form of a balance, capable of measuring current strengths readily expressed in centiamperes (i. e., from  $\frac{1}{100}$  ampere to 1 ampere).
- Centigrade Thermometer Scale.**—A thermometer scale in which the length of the thermometric tube, between the melting point of ice and the boiling point of water, is divided into one hundred equal parts or degrees.
- Centigramme.**—The hundredth of a gramme, or, 0.1543 grains avoirdupois.
- Centilitre.**—The hundredth of a litre; or, 0.6102 cubic inch.
- Centimetre.**—The hundredth of a metre; or, 0.3937 inch.
- Centimetre-Gramme-Second System.**—A system based on the centimetre as the unit of length, the gramme as the unit of mass, and the second as the unit of time.
- Centimetre-Gramme-Second Units.**—The units of the centimetre-gramme-second system.
- Centipede Cable-Grapple.**—A grapple whose projecting prongs give it an appearance somewhat resembling a centipede.
- Central.**—A name given to any central telephone exchange or office.
- Central Galvanization.**—A variety of general galvanization in which the cathode is placed over the epigastrium and the anode moved over the body.
- Central Lighting-Station.**—A station where the generators and distributing apparatus are placed for producing the current which lights the lamps in a given district.
- Central-Station Burglar-Alarm.**—A burglar-alarm whose contacts, situated at the place to be protected, are connected by suitable circuits with alarms placed in a centrally located station.
- Central-Station Lighting.**—The lighting of a number of houses or other buildings from a single centrally located station.
- Central-Station Multiple-Switch-Board.**—A switchboard employed in a central telephone exchange, in which each subscriber's jack appears in more than a single panel.
- Central Telephone Exchange.**—(1) A central telephone office connected with a plurality of subscribers or telephone stations. (2) A central exchange connected with a plurality of local exchanges.
- Central-Telephone-Exchange Multiple-Switchboard.**—Any form of switchboard employed in a central telephone exchange, by means of which numerous subscribers connected therewith can be readily connected to one another.
- Centrally Grounded Wire of Railway Circuit.**—A conductor or wire extending along the roadbed, parallel to the rails of a pair of tracks, connected to the bond wires, and itself grounded at intervals.
- Cement-Lined Conduit.**—A conduit of wood, stone or metal, the surfaces of whose ducts are lined with cement.
- Centre-Pole Trolley Lane Construction.**—A form of aerial line construction in which the trolley wires are suspended from poles placed in the middle of the street or road.
- Centre of Distribution.**—In a system of incandescent distribution any point at which the supply current is branched or radially distributed to mains, to submains, or to translating devices.
- Centre of Gravity.**—The centre of weight of a body.
- Centre of Oscillation.**—A point in a body swinging like a pendulum, which is neither accelerated nor retarded, during its oscillations, by the portions of the pro-

dulum that are situated above or below it.

**Centre of Percussion.**—That point in a body, suspended so as to move as a pendulum, at which a blow perpendicular to the radius would produce no pressure at the axis.

**Centre-Pole Construction.**—In a double-track trolley system, especially on broad streets, a system of pole construction in which poles are placed between the two tracks, provided with bracket arms extending over each track for the support of the trolley wire.

**Centro Railway Line.**—A trolley line of centre-pole construction.

**Centrifugal Force.**—That force which is supposed to urge a rotating body directly away from the centre of rotation.

**Centrifugal Governor.** A device for maintaining constant the speed of a steam engine or other prime mover, despite certain changes in its load or work.

**Centrifuge.**—(1) An apparatus for separating solids from liquids or liquids of different density from one another by centrifugal forces. (2) A centrifugal separator.

**Centrifuge, Electric.**—A centrifuge driven by an electromagnetic motor.

**Centripetal.**—Seeking the centre.

**Cerebration.**—The action of the brain in producing thought.

**Chafe.**—A weak or worn place in the sheathing of a submarine cable due to attrition.

**Chafing-Dish, Electric.**—An electrically-heated chafing dish.

**Chain Cable-Grapple.**—A grapple whose prongs are attached to the links of a chain.

**Chain Lightning.**—A variety of lightning flash in which the discharge assumes a rippling, chain-like appearance.

**Chain Pull.**—A pendant chain attached to a pendant burner for the movement of the wipe-spark spring and the ratchet in an electrically-lighted gas-burner.

**Chamber of Incandescent Lamp.**—The glass bulb or chamber of an incandescent lamp, provided for maintaining a high vacuum, and for the reception of the filament.

**Change-Over Switch.**—A switch provided in a central station for transferring a working circuit from one dynamo to another, or from one battery of dynamos to another.

**Change Ratio of Transformer.**—The ratio of transformation.

**Changing Switch.**—A change-over switch.

**Characteristic Curve.**—(1) A diagram in which a curve is employed to represent the relation of certain varying values. (2) A curve indicating the characteristic properties of a dynamo-electric machine under various phases of operation. (3) A curve indicating the electromotive force of a generator, as a variable dependent on the excitation.

**Characteristic Curve of Dynamo.**—A curve showing the pressure at the terminals of a dynamo at different field excitations.

**Characteristics of Sound.**—(1) The peculiarities that enable different musical sounds to be readily distinguished from one another. (2) The tone or pitch, intensity or loudness, and the quality or timbre of sounds.

**Charge Accumulator.**—A word sometimes given to a Leyden jar or condenser.

**Charge Current on Telegraphic Line.**—The current produced by the initial rush of electricity into a telegraph line on the closing of the circuit.

**Charge, Electric.**—The quantity of electricity that exists on the surface of an insulated electrified conductor.

**Charged Body.**—A body containing an electric charge.

**Charged Cell.**—A cell of a storage battery that has been acted on by a charging current.

**Charging Accumulators or Storage Batteries.**—Sending an electric current into storage batteries or accumulators for the purpose of enabling them to act as electric sources.

**Charging Current.**—The current employed in charging a storage battery or accumulator.

**Chattorton's Compound.**—An insulating compound for cementing together the alternate coatings of gutta-percha employed on a cable conductor, or for filling up the space between the stranded conductors.

**Checking Action.**—A term sometimes employed for a dampening action.

**Checking Instrument.**—An instrument in a cable station for recording sending or out-going signals on a recorder slip.

**Chemical Affinity.**—(1) Atomic attraction. (2) The force that causes atoms to unite and form molecules.

**Chemical Annunciator.**—A term some-



times employed for electrolytic annunciator.

**Chemical Battery.**—A name sometimes given to a voltaic telegraph battery as distinguished from a dynamo.

**Chemical Change.**—Any change in matter resulting from atomic combination and the consequent formation of new molecules.

**Chemical Effect.**—(1) Any effect occasioned by atomic combination, in which the substances entering into combination lose all those properties and peculiarities by which they are ordinarily recognized. (2) Atomic combination resulting in the formation of new molecules.

**Chemical Equivalent.**—(1) The quotient obtained by dividing the atomic weight of an elementary substance by its atomicity. (2) The ratio between the quantity of an element and the quantity of hydrogen it is capable of replacing. (3) The quantity of an elementary substance that is capable of combining with or replacing one atom of hydrogen.

**Chemical Galvano-Cautery.**—A term sometimes applied to electro-puncture or the application of electrolysis to the treatment of diseased growths.

**Chemical Generator of Electricity.**—A term sometimes employed in place of a voltaic pile or battery.

**Chemical Phosphorescence.**—A variety of phosphorescence in which the emitted light is produced by the actual combustion of a specific chemical substance by the oxygen of the air, as in the phosphorescence of the fire-fly, or the glow-worm.

**Chemical Photometer.**—A photometer in which the intensity of light to be measured is determined by the amount of chemical action produced in a given time.

**Chemical Potential Energy.**—The potential energy possessed by the elementary chemical atoms.

**Chemical Recording Meter.**—A meter which records by means of electrolysis the quantity of electricity supplied in a given time.

**Chemical Separation.**—Chemical decomposition.

**Chemical Telegraph.**—A general term for the apparatus employed in chemical telegraphy.

**Chemical Telegraphy.**—A system of telegraphy, in which the dots and dashes of the Morse alphabet, or other telegraphic code, are recorded on a fillet of moistened paper by the electrolytic action of the

current on some chemical substance with which the paper is impregnated.

**Chemical Telephone.**—The name given to a telephone operating on the principles of the electro-photograph.

**Chemical Velocity.**—The ratio of the amount of substance transformed in any chemical process to the time required for its transformation.

**Chemism.**—A word sometimes employed for chemical affinity.

**Chief Operator.**—The senior operator on duty in a telegraph or telephone office.

**Chimes, Electric.**—A chime of bells rung by the attractions and repulsions of electrostatic charges.

**Chimney Bracket.**—A bracket for supporting an overhead wire fastened to a chimney corner.

**Chloride Storage Cell.**—A name given to a storage-cell in which the plates are formed of grids of antimonious lead, cast around pastilles or buttons of fused chloride of lead, which, when properly subjected to the charging current, are converted into spongy metallic lead and lead peroxide, on the negative and positive plates respectively.

**Choke Coil.**—A name sometimes given to a choking coil.

**Choke Magnet.**—A word sometimes used for choking coil.

**Choking Coil.**—A coil of wire so wound on a core of iron as to possess high self-induction when used on alternating-current circuits.

**Choking Effect.**—The effect produced by a choking coil in obstructing or cutting off an alternating current with a smaller loss of power than would its use as a mere ohmic resistance.

**Chord Armature Windings.**—(1) Armature windings partly formed by chords of arcs on the periphery to which they are applied. (2) An armature winding in which the wire is carried from one point on the surface to another along a chord of the included arc.

**Chromosphere.**—An intensely hot gaseous envelope surrounding the central luminous nucleus or photosphere of the sun.

**Chronograph, Electric.**—An electric apparatus for automatically measuring and registering small intervals of time.

**Chronograph Record.**—A record obtained by means of a chronograph.

**Chronometer, Electric.**—An electrically controlled and operated mechanism for indicating and recording time.



**Chronoscope, Electric.**—(1) An apparatus for electrically indicating but not measuring small intervals of time. (2) An electrically operated device by which small intervals of time can be measured.

**Cigar-Lighter, Electric.**—An apparatus for electrically lighting a cigar.

**Cinematograph.**—A biograph.

**Cipher Code.**—A code in which a number of words or phrases are represented by single words, or by arbitrary words or syllables.

**Cipher Message.**—A code message.

**Circle of Reference.**—A circle by reference to which simple-harmonic motion may be studied by comparison with uniform motion around such circle.

**Circuit Breaker.**—Any device for opening or breaking a circuit.

**Circuit Closer.**—Any device for making or closing a circuit.

**Circuit-Closer Bell-Pull.**—A device, suitable for attachment to a mechanical door pull, which makes a contact for the ringing of an electric bell, without preventing the original bell from being operated by the mechanical pull.

**Circuit, Electric.**—The path in which electricity circulates or passes from a given point around or through a conducting path back again to its starting-point.

**Circuit Indicator.**—A rough form of galvanometer employed to indicate the presence and direction of a current in a circuit, and, in some cases, to roughly indicate its strength.

**Circuit Loop-Break.**—A device for introducing a loop into any part of an aerial line circuit.

**Circuit Loop-Break Insulator.**—An insulator employed in a circuit loop-break.

**Circuital.**—(1) Of or pertaining to a circuit. (2) Flowing or passing in a closed circuit.

**Circuital Flux.**—(1) A term sometimes employed for circular flux. (2) The flux surrounding any circuit. (3) Flux completing a closed circuit.

**Circuital Gaussage.**—The gaussage as measured once completely around a closed magnetic circuit.

**Circuital Vector.**—A vector quantity which does not terminate in space but forms a closed curve or endless chain.

**Circuital Voltage.**—The voltage as measured around a closed circuit.

**Circulation.**—The line integral of a vector quantity taken around a circuit.

**Circular Bell.**—A term sometimes applied to a bell so constructed that all of its moving parts are contained in the gong.

**Circular Current.**—A current flowing through a circular path.

**Circular Flux.**—(1) A term sometimes employed for the concentric circular flux which surrounds an active cylindrical wire or conductor. (2) Generally, circuital flux.

**Circular Magnetic Flux.**—Circular flux.

**Circular Magnetism.**—(1) The magnetism of a cylindrical rod of iron or steel one of whose poles extends circumferentially around the rod while the other pole is situated at and around its centre. (2) A circular distribution of magnetic flux.

**Circular Magnetization.**—The magnetization producing circular magnetism.

**Circular Mil.**—(1) A unit of area employed in measuring the cross-section of wires, equal, approximately, to 0.7854 square mils. (2) The area of a circle one mil in diameter.

**Circular Millage.**—The areas of cross-sections of wires or conductors expressed in circular mils.

**Circular Scratch Brush.**—A scratch brush of circular shape, suitable for being set in rapid rotation by a lathe.

**Circular Touch.**—A method of magnetization by touch in which four bars are placed in the form of a rectangle and the magnetizing magnet is placed in contact at any point, drawn around the rectangle a number of times, and removed at the point where its motion began.

**Circular Type of Periodically Alternating E. M. F.**—A periodically alternating E. M. F. having a curve whose values in different parts of a cycle are such that when plotted in a curve they will produce a circular outline.

**Circular Units of Area.**—Various units employed for measuring areas of cross-section by reference to the area of a unit circle, such, for example, as the circular mil.

**Circulating Power.**—A term employed by Hopkinson for the method of taking power out of a machine as a motor and utilizing this power to drive the generator with which it is connected.

**Circumferential Speed.**—The speed of any point on the circumference of a rotating wheel or armature.

**Circumflux.**—A term sometimes employed for the product of armature current and the total number of armature conductors divided by the number of poles.

**Clamp for Arc Lamps.**—(1) A device for gripping the lamp rod of an arc-lamp.

(2) The carbon clutch or clamp of an arc-lamp.

**Clamp Splicing-Ear.**—A trolley splicing ear in which the two ends of the wire are placed in the jaws of a clamp and then pressed together and secured by a bolt.

**Clamp Terminals.**—Simple screw-clamps serving as terminals for connecting the ends of flexible cords or other wires.

**Clark Element.**—A name sometimes given to a Clark standard voltaic cell.

**Clark's Compound.**—A bituminous and siliceous compound employed on the outer casing of the sheathing of a submarine cable.

**Clark's Standard Voltaic Cell.**—A form of zinc-mercury couple employed, in connection with electrolytes of mercurous sulphate and zinc sulphate, as a standard cell.

**Clay Electrode.**—A therapeutic electrode of clay shaped so as to fit the part of the body to be treated.

**Clearance.**—The gap space between the surface of a rotating armature and the opposed polar surface of the field magnets of a dynamo or motor.

**Clearance Space.**—The clearance.

**Clearing.**—In telephony, the operation of disconnecting subscribers who have been in connection, and restoring the lines to their normal conditions.

**Clearing-Out Drops.**—(1) Electro-magnetic drop-shutters placed in a telephone exchange in circuit with a pair of communicating subscribers, so that the falling of the shutter when they "ring off" indicates that the conversation is ended.  
(2) Ring-off drops.

**Clearing-Out Relays.**—Relays provided for operating clearing-out drops.

**Clearing Signal.** (1) A ring-off signal.  
(2) A signal in a telephone exchange to indicate that a telephonic conversation has ended.

**Cleat Wiring.**—Placing or establishing electric conductors or wires on walls or ceilings by means of suitably shaped insulating cleats.

**Cleat, Electric.**—A suitably shaped piece of wood, porcelain, hard-rubber or other non-conducting material used for fastening and supporting electric conductors to ceilings and walls.

**Cleavage Electricity.**—Electrification produced by the cleavage of crystalline substances.

**Clepsydra, Electric.**—An instrument measuring time by the escape of water or other liquid under electric control.

**Click Wire.**—(1) A wire of a telephone switchboard employed engaged test, by which a click is in the operator's telephone when a subscriber asked for is busy.  
(2) Test wire.

**Clip.**—A slight break in signalling by a signal is unduly shortened, likely to occur with an imperfect ment of duplex or quadruplex telegraph.

**Clip Switch.**—A switch in which switch-lever enters the base of a contact.

**Clipping of Telegraphic Signal.**—curtailing of a telegraphic signal, defective adjustments or to disturb on the line.

**Clock, Electric.**—A clock the hands of which are moved, controlled or regulated either entirely or partially, by the electric current.

**Clock Meter.**—An electric meter in which clock-work is employed.

**Clock Register.**—A register employed in connection with a clock for recording the time of an occurrence.

**Clockwise Motion.**—A rotary motion whose direction is the same as the hands of a clock, viewed from the front.

**Clockwork Feed for Arc Lamp.**—A lamp mechanism in which one carbon is fed by trains of clockwork.

**Closed Car-Wheel.**—A car-wheel in which the portion of the wheel between the flange and the axle is formed in one imperforate mass.

**Closed Circuit.**—A completed electric circuit.  
**Closed - Circuit Burglar-Alarm.**—A burglar alarm that is normally out of circuit, and which operates on the closing of the circuit by the opening of contacts.

**Closed-Circuit Signalling.**—A system of single-circuit signalling in which sending batteries are placed at each end of the line and are so connected that they remain always in circuit.

**Closed-Circuit Thermostat.**—A thermostat maintained normally out of circuit.

**Closed-Circuit Transformer.**—A transformer sometimes employed for closed-circuit transformer.

**Closed-Circuit Voltaic Cell or Battery.**—A voltaic cell or battery in which the circuit is not broken, and which may be left for a considerable time on a

circuit of comparatively small resistance without serious polarization.

**Closed-Circuit Voltmeter.**—A voltmeter intended to be in permanent connection with the pressure it is designed to measure.

**Closed-Circuited.**—Placed in a closed or completed circuit.

**Closed-Circuited Conductor.**—A conductor connected in a closed or completed circuit.

**Closed-Circular Current.**—A current flowing in a circular circuit.

**Closed-Circular Solenoid.**—A circular solenoid closed upon itself so as to form a torus.

**Closed-Coil Armature.**—(1) An armature the coils of which are never on open circuit during rotation. (2) A dynamo armature whose coils are grouped in sections and connected with successive bars of a commutator, so as to be continuously connected together in a closed circuit.

**Closed-Coil Winding.**—Any winding by which the armature coils are connected in closed circuit during the operation of the machine.

**Closed-Conducting Sheath for Lightning Protector.**—A method for lightning protection consisting in forming a wire-sheathing or netting around the object to be protected.

**Closed Iron-Circuit Transformer.**—(1) A transformer, the core of which forms a completed magnetic circuit. (2) An iron-clad transformer.

**Closed Iron-Magnetic Circuit.**—A magnetic circuit all of whose path is completed by iron.

**Closed Loop.**—A single loop of wire or conductor placed on a closed circuit.

**Closed-Loop Parallel-Circuit.**—A variety of parallel circuit in which both the leading and returning conductors form closed loops, between which the translating devices are bridged.

**Closed Magnetic Circuit.**—A magnetic circuit which lies wholly in iron or other substance of high magnetic permeability.

**Closed Magnetic Circuit of Atom.**—A closed magnetic circuit whose flux is supposed to lie entirely within the atom.

**Closed-Magnetic Circuit of Molecule.**—A closed magnetic circuit assumed to lie wholly within the molecule.

**Closed Magnetic Core.**—A magnetic circuit so shaped as to provide a complete iron path or circuit for the magnetic flux of its field.

**Closet System of Parallel Distribution.**—A system of parallel distribution and house wiring in which the various receptive devices are collected in groups each of which is supplied with a separate and independent supply circuit back to the service; as distinguished from a tree system.

**Closed Trolley Car.**—A trolley car enclosed from the outer air as distinguished from an open or summer car.

**Closure.**—The completion of an electric circuit.

**Clown's Hat Curve.**—A curve of current or electromotive force in which the pressure generated increases or decreases at a rapid rate of change, and whose shape is somewhat similar to the shape of a peaked hat or a clown's hat.

**Club-Footed Electro-Magnet.**—An electro-magnet whose core is in the form of a horseshoe and is provided with a magnetizing coil on one pole only.

**Cluster Call.**—A globe of metal from which a cluster of incandescent lamps radiate.

**Clutch for Arc Lamps.**—A carbon clutch or clamp for arc lamps.

**Clutching Device.**—(1) Any device employed for clutching or holding the carbons in an arc-lamp. (2) A device for clutching or holding any object subjected to occasional motion.

**Coarse Winding of Field Magnets.**—The series-winding of a compound-wound machine.

**Co-acting.**—Acting simultaneously or together.

**Coating.**—An adherent layer or covering.

**Coating of Condenser.**—A sheet of tin foil placed on one side of a Leyden jar or condenser, directly opposite a similar sheet on the other side, for the purpose of receiving and collecting an electric charge.

**Coatings of Leyden Jar.**—The sheets of tin foil or other conductor placed on opposite sides of a Leyden jar or condenser.

**Code Name.**—In telegraphy, the symbol, word, or group of letters, standing for, or representing the name of some person, association, or thing, according to a pre-arranged code.

**Code or Coded Telegraphy.**—A system of telegraphy employed for sending despatches in which the time required for transmitting is considerably decreased by employing code words instead of the actual words of the message.



**Coded Telegraph Messages or Code Messages.**—Messages that are sent by the use of prearranged words, any one of which may stand for a group of words, a phrase, or a complete sentence.

**Code Time.**—In telegraphy, the code signals in the preamble of a message which signify and indicate the time at which the message was received for transmission.

**Coefficient of Electro-Magnetic Inertia.**—A term sometimes employed in place of the coefficient of inductance or self-inductance of a circuit.

**Coefficient of Expansion.**—The fractional increase in the length of a bar or rod, when heated from 32 to 33 degrees Fahr., or from 0 to 1 degree Cent.

**Coefficient of Hysteresis.**—(1) The work expended hysteretically in a cubic-centimetre of iron or other magnetic substance, in a single cycle of unit magnetic flux density. (2) The coefficient which multiplied by the volume of iron, the frequency of alternation, and the 1-6th power of the maximum flux density gives the hysteretic activity.

**Coefficient of Inductance.**—(1) A constant quantity such that, when multiplied by the current strength passing through any coil or circuit, will numerically represent the flux linkage with that coil or circuit due to that current. (2) A term sometimes used for coefficient of self-induction. (3) The ratio of the C. E. M. F. of self-induction in a coil or circuit to the time-rate-of-change of the inducing current.

**Coefficient of Induction.**—A term sometimes used for coefficient of magnetic induction.

**Coefficient of Magnetic Induction.**—(1) A term sometimes used instead of magnetic permeability. (2) The ratio between the quantity of magnetic flux that passes through any area of normal cross-section of a magnetic circuit and the magnetizing force producing that flux.

**Coefficient of Magnetic Leakage.**—(1) The ratio of the flux through a leakage path to the flux through an armature. (2) The ratio of the mutual induction in a transformer as reduced by magnetic leakage to the mutual induction in the absence of magnetic leakage.

**Coefficient of Magnetization.**—A number representing the intensity of magnetization produced in a magnetizable body divided by the magnetizing force, and usually represented by the symbol  $k$ .

**Coefficient of Mutual Inductance.**—

(1) The ratio of the electromotive force induced in a circuit to the rate-of-change of the inducing current in a magnetically associated circuit. (2) The ratio of the total flux-linkage with a circuit proceeding from an associated inducing circuit, to the strength of current flowing in the latter.

**Coefficient of Mutual Induction.**—The coefficient of mutual inductance.

**Coefficient of Potential.**—(1) A coefficient which multiplied into the charge of a body gives its potential. (2) The ratio of the potential of an electrified body to its charge, when all neighboring bodies are uncharged.

**Coefficient of Reflection.**—The percentage value expressing the ratio of the intensity of the reflected ray to the intensity of the incident ray.

**Coefficient of Self-Induction.**—(1) Self-inductance. (2) The ratio in any circuit of the flux induced by and linked with a current, to the strength of that current. (3) The ratio in any circuit of the E. M. F. of self-induction to the rate-of-change of the current.

**Coercitive Force.**—A name sometimes employed for coercive force.

**Coercive Force.**—(1) The power of resisting changes in magnetization. (2) In cyclic magnetization the demagnetizing force which must be applied to a magnetic substance in order to completely demagnetize it.

**Coherrer.**—A detector of electro-magnetic waves consisting of conducting particles forming a semi-conducting bridge between two electrodes.

**Coil and Plunger for Electro-Magnet.**—A movable iron core which is attracted into a hollow coil or solenoid when a current passes through said coil.

**Coil, Electric.**—(1) A convolution of insulated wire through which an electric current may be passed. (2) A number of turns of wire, or a spool of wire, through which an electric current may be passed.

**Coil-Heater, Electric.**—A heater whose heat is obtained by the passage of an electric current through a suitably supported coil of wire.

**Coil Winding.**—Loop or lap winding.

**Coil Winding of Alternator.**—(1) A form of winding applied to the armature of an alternator in which the wire is made into coils that are laid upon the surface of the armature core. (2) A term sometimes used for loop winding.



**Cooling Space of Cable Tank.**—The space provided in a cable tank for the reception of a cable.

**Coked Core of Incandescent Filament.**—An incandescent lamp filament formed of a core of electrically coked carbon whose surface is covered with a deposit of carbon by the flashing process.

**Coked Filament.**—A carbon filament for an incandescent lamp that has been so subjected to electrical heating in a vacuum as not only to be thoroughly freed from its occluded gases but also to have its carbon changed into a variety of coke.

**Coking, Electric.**—Subjecting carbon to the coking process.

**Coking of Filament.**—Subjecting a filament to the coking process.

**Coking Process for Filament of Incandescent Lamp.**—A process for converting the carbon of an incandescent filament into coke by subjecting it, while in a vacuum, to the prolonged heating action of a powerful electric current.

**Cold Light.**—(1) Luminous radiation unaccompanied by obscure radiation. (2) Radiation confined within the limits of the visible spectrum. (3) The light of a fire-fly or glow-worm.

**Collapsing Drum.**—A visual-signal drum capable of manual distension and collapse.

**Collation.**—The repetition of a message or important parts of the same by an operator at a telegraph station who has received it over the line, to the transmitting operator at the sending station.

**Collecting Ammeter.**—An ammeter in a central station which collects, and, therefore, indicates the total current received from two or more separate generators, and usually employed to indicate the total current output of a station.

**Collecting Brushes of Dynamo-Electric Machine.**—Conducting brushes which bear on the commutator cylinder of a dynamo and carry off the current generated by the E. M. F. in the armature coils. (2) The brushes which bear on the collecting rings of an alternator armature.

**Collecting Combs.**—The collecting points of a frictional electric machine, or of an electrostatic induction machine.

**Collecting Panel.**—A panel in a switchboard which collects all the current supplied by the generators connected to that switchboard.

**Collecting Rings for Alternators.**—Metallic rings connected with the terminals of the armature coils of an alter-

nator on which brushes rest to carry off the alternating currents.

**Collectors, Electric.**—Devices employed for collecting electricity from a moving electric source.

**Collectors of Alternators.**—The collecting rings.

**Collectors of Dynamo-Electric Machine.**—The brushes that rest on the commutator cylinder and carry off the current generated on the rotation of the armature.

**Collectors of Frictional Electric Machine.**—The metallic points that collect the charge from the glass plate or cylinder of a frictional electric machine.

**Colloids.**—One of the two classes into which substances are separated by dialysis.

**Colombin.**—An insulating substance consisting of a mixture of sulphates of barium and calcium placed between the parallel carbons of the Jablochhoff candle.

**Column, Electric.**—A term formerly applied to a voltaic pile.

**Colza Oil.**—The oil employed in the Carcel standard lamp.

**Comazant.**—(1) A term formerly applied to a St. Elmo's fire. (2) A corpusant.

**Collector Rings.**—The collecting rings of an alternator.

**Comb Lightning-Arrester.**—A form of lightning-arrester in which the line wires are connected to two metallic plates provided with serrations like the teeth of a comb, and placed near to another ground-connected plate, which may or may not be furnished with similar serrations.

**Comb of Storage Battery.**—The grid of a storage battery.

**Comb Protector.**—A comb lightning-arrester.

**Combination Anchor-Poles.**—(1) An anchor pole intended for the support of both aerial wires and aerial cables. (2) A composite anchor-pole.

**Combination Bracket.**—(1) A bracket for supporting a pair of insulators side by side. (2) A bracket for supporting both a gas lamp and an incandescent lamp.

**Combination Fittings for Chandeliers.**—Fittings that provide for the use of both gas and electricity.

**Combination Gas-Fixtures.**—Combination fittings.

**Combination Lightning-Protector.**—A form of combined film and fuse lightning-protector employed on telephone

- circuits, arranged so as to ground the circuit either under the action of high pressures, or under the action of an unduly strong current.
- Combination Line-Protector.**—A combination lightning-protector.
- Combination Protector.**—A combination lightning-protector.
- Combination Rheostat.**—A form of box rheostat, or resistance box, which contains within its cover several separate series of resistance coils.
- Combination Triphase-Winding.**—A triphase winding combining both the star winding and the triangular winding.
- Combined Fibre and Spring Suspension.**—A suspension of a needle by the combined use of a spiral spring and a single fibre.
- Combined Tangent and Sine Galvanometer.**—A galvanometer furnished with two magnetic needles of different lengths, one a small needle for tangent measurements, and the other a long needle for sine measurements.
- "Come Along."**—A small portable vise capable of ready attachment to an aerial telegraph or telephone cable, and used in connection with a line dynamometer to pull up the wire to its proper tension.
- Commercial Efficiency.**—The useful or available energy produced by any machine or apparatus divided by the total energy it absorbs.
- Commercial Efficiency of Dynamo, or Generator.**—The ratio of the output of a dynamo, or the useful and available electric energy delivered at its terminals, divided by its intake, or the mechanical energy required to drive it.
- Commercial Efficiency of Motor.**—The ratio between the mechanical activity developed at a motor pulley and the electric activity absorbed at its terminals.
- Common Arc of Aurora Glory.**—The inner or common arc of an aurora glory.
- Common Return.**—A return conductor common to several circuits.
- Common Side of Quadruplex System.**—In quadruplex telegraphy, the neutral or No 2 side, as distinguished from the polar or No 1 side.
- Communicator, Electric.**—A term formerly employed for a telegraphic key.
- Commutating Machine.**—A rotary transformer.
- Commutation.**—The act of commuting or causing a number of electromotive forces or currents to take one and the same direction.
- Commutation Fringe.**—A space employed for the induction of the leading edge or fringe of the magnetic pole tip, under which commutator place.
- Commutator.**—(1) Any device employed in one portion of a circuit for the induction of electromotive forces in another portion. (2) A device for changing alternating into direct currents, or vice versa.
- Commutator.**—A name sometimes applied to a universal switch or jan switch.
- Commutator Bar.**—One of the segments of a commutator.
- Commutator Coils.**—Coils wound on an armature core for the purpose of preventing sparking, connected at their ends to the main winding, between the coil sections, and at the other end to the commutator segments.
- Commutator Motor.**—An alternating current motor in which the armature is provided with a commutator.
- Commutator of Dynamo-Electric Machine.**—The device employed for changing the electromotive forces generated by the armature, on its rotation in the field, to take one and the same direction externally.
- Commutator Press Button.**—A button employed in a system of telegraph at a subscribers' station, for connection with a central station by reversing a battery.
- Commutator Segments or Strips.**—Insulated bars of a commutator.
- Commutatorless.**—Devoid of a commutator.
- Commutatorless Continuous Dynamo.**—(1) A dynamo that generates continuous currents without a commutator. (2) The so-called permanent magnet dynamo.
- Commutated.**—Caused to take one and the same direction.
- Commutated Currents or Electromotive Forces.**—Currents or electromotive forces that have undergone commutation.
- Commutated Magneto-Generator.**—A magneto-generator whose currents are commutated.
- Commutated.**—Commutated.
- Commutating.**—Commutating.
- Commuting.**—Changing direction.
- Commuting Transformer.**—A transformer with a commutator.

**Companion Loops.**—A pair of telegraphic loop-circuits, connecting a pair of branch offices with the main office, in which there is a duplex set, so connected therewith, that the instruments at the branch offices are made the virtual duplex instruments of the main station: one branch office sending while the other is receiving.

**Comparator.**—An apparatus for comparing standards of lengths or gauges.

**Compartment Man-Hole of Conduit.**—A man-hole provided with suitably supported shelves or compartments that protect different cable sections.

**Compass.**—A mariner's compass.

**Compass Card.**—A card used in a mariner's compass on which are marked the four cardinal points of the compass: North, South, East and West, and again subdivided into 32 points called rhumbs, and also frequently divided circumferentially into degrees.

**Compass Sights.**—Small holes or narrow slits made in opaque plates, affixed to the compass box, for use in taking bearings.

**Compensated Alternator.**—An alternator employed for sustaining a uniform voltage at some point of its circuit under varying loads, whose field magnets are excited partly by constant currents taken from a separate generator, and partly by currents supplied by the load current in the armature.

**Compensated Excitation of Alternator.**—The excitation of an alternating-current dynamo whose field is partly separately excited, and partly excited from the main circuit of the machine.

**Compensated Galvanometer.**—A differential galvanometer for indicating pressure at a distant point of a continuous-current circuit, having one coil in shunt and the other in series with said circuit.

**Compensated Meter-Bridge.**—A meter-bridge so arranged that its indications are compensated for the effects of temperature.

**Compensated Resistance-Coil.**—A resistance-coil so arranged as to be compensated for the effect of temperature upon its resistance.

**Compensated System of Currents.**—In telegraphy with the Wheatstone automatic apparatus, a system of double-current signalling in which both the initial and final currents are weakened before removal by the interposition of a resistance in the battery circuit.

**Compensated Voltmeter.**—A central-

station voltmeter connected to the bus-bars in such a manner that its indications are automatically corrected for the drop of pressure in some particular feeder or group of feeders, so that its readings correspond to the pressure supplied to the mains.

**Compensated Wattmeter.**—A wattmeter so wound as to be compensated for the effect of reactance in its shunt circuit.

**Compensated Coils.**—A term sometimes applied to the series coils placed on a shunt-wound machine.

**Compensated Condenser.**—A condenser employed in duplex telegraphy to give to the artificial line a static capacity equal to that of the main line.

**Compensated Potential-Indicator.**—A compensated voltmeter.

**Compensating Line.**—An artificial line employed in duplex telegraphy.

**Compensating Magnet.**—A magnet placed over a galvanometer or other needle, for the purpose of varying the direction and intensity of the earth's magnetic force on such needle.

**Compensating Pole.**—A small bar electro-magnet, or electro-magnetic coil, placed perpendicularly between the pole-pieces of a dynamo to compensate for the cross magnetization of the armature currents.

**Compensating Wire.**—In a system of differential duplex telegraphy the artificial line or wire, as distinguished from the real line or wire.

**Compensation Photometer.**—(1) A photometer in which the illumination of the two parts of the photometer screen is equalized by diminishing the intensity of the pencil of light by polarization. (2) A polarization photometer.

**Compensator.**—An auto-transformer.

**Compensator for Alternating-Current Lamps.**—A choking coil or compensator, placed in circuit with the lamps in an alternating-current circuit, for the purpose of automatically regulating the current strength in the lamps.

**Compensator System.**—A system of alternating-current electric distribution from high-pressure mains to low-pressure translating devices, in which the latter are connected in derived circuits between sections of choking coils connected across the mains.

**Complement of Angle.**—What an angle lacks to make its value equal to 90°, or a right angle.

**Complete Fault.**—Any fault which completely interrupts telegraphic or telephon-



is communication as distinguished from a partial fault.

**Complete Wave.**—(1) Two successive alternations, or a double alternation of a periodically-alternating quantity. (2) A cycle.

**Completed Circuit.**—(1) A closed circuit. (2) A circuit whose conducting continuity is unbroken.

**Completing a Circuit.**—Closing a circuit.

**Complex Distribution of Lamellar Magnetism.**—A distribution of the magnetism of a finite magnet into an infinite number of complex-magnetic shells.

**Complex-Harmonic Motion.**—Motion resulting from the superposition or co-action of a plurality of simple-harmonic motions.

**Complex-Harmonic Alternating E. M. F.s.**—Electromotive forces resulting from the combination of a fundamental-harmonic electromotive force and its harmonics.

**Complex-Harmonic Currents.**—Currents produced by complex-harmonic electromotive forces.

**Complex-Harmonic Electromotive Forces.**—Complex-harmonic alternating electromotive forces.

**Complex-Magnetic Shell.**—(1) A magnetic shell whose strength varies from one part to another of its surface. (2) A distribution of magnetization equivalent to an association or superposition of a number of separate magnetic shells of arbitrary strength and area.

**Complex Quantities.**—Any quantity made up of two parts, one of which is measured along an axis of reference, and the other in a direction at right angles to such axis, these axes being sometimes described as the real and imaginary axes respectively.

**Component.**—One of the two or more separate forces into which any single force may be resolved; or, conversely, the separate forces which together produce any single resulting force.

**Component Currents.**—The two or more currents into which it may be conceived that a single current may be divided so as to be the equivalent of that single current.

**Component Electromotive Forces.**—The two or more E. M. F.s into which any given E. M. F. may be resolved.

**Component Inductions.**—The two or more inductions into which any given magnetic flux may be resolved so as to be its equivalent.

**Components of Impedance.**—The energy component or effective resistance, and the wattless component or effective reactance.

**Composite Anchor-Pole.**—A combination anchor-pole.

**Composite Balance.**—A balance with two pairs of fixed coils of coarse and fine wire respectively, employed for measuring strong or feeble currents as desired.

**Composite Dynamo.**—A compound-wound dynamo.

**Composite Excitation.**—Any excitation of the field magnets of a dynamo in which more than a single winding is employed, such as a shunt and a series winding.

**Composite Field.**—The field of a compoundly-excited dynamo.

**Composite-Field Dynamo.**—(1) A dynamo whose field has a composite excitation. (2) A dynamo whose field is compound wound.

**Composite Grid.**—A storage-battery grid made of a number of sheets of lead foil covered with graphite, placed between two plates of sheet lead which are held together with lead rivets.

**Composite Horse-Shoe Magnet.**—A compound horse-shoe magnet.

**Composite Kilo-Ampere Balance.**—A balance form of ammeter, provided with coarse and fine windings, so arranged that the instrument will serve as a kilo-ampere meter, as a centi-ampere meter, or, as a voltmeter.

**Composite Wire.**—(1) A wire provided with a steel core and an external copper sheath, possessing sufficient tensile strength to enable it to be used in long spans without excessive sagging. (2) A bimetallic wire.

**Compoundly-Excited Dynamo.**—(1) A compound-wound dynamo. (2) A composite-field dynamo.

**Composition of Forces.**—Finding the direction and intensity of a single force which represents the total effect of two or more forces that are acting simultaneously on a body.

**Compound.**—An asphaltic composition employed in the sheathing of submarine cables.

**Compound Alternator.**—A compound-wound alternator.

**Compound Arc.**—An arc formed of more than two separate electrodes.

**Compound Battery.**—A term formerly employed for a battery of voltaic cells, as



contradistinguished from a single cell. (Obsolete.)

**Compound Cable.**—A multiple-core cable.

**Compound Circuit.**—A circuit containing more than a single source, or more than a single electro-receptive device, or both. (Not in general use.)

**Compound Condenser.**—(1) A name sometimes given to subdivided condenser. (2) A composite condenser.

**Compound Electro-Magnet.**—A word formerly employed for an electro-magnet consisting of an iron core wound with two or more separate magnetizing circuits. (Not in general use.)

**Compound Magnet.**—A number of single magnets placed parallel, side by side, and with their similar poles adjacent.

**Compound Radical.**—(1) A group of unsaturated atoms. (2) A group of elementary atoms some of whose bonds are interconnected or joined with the bonds of other atoms.

**Compound Receiver.**—A telephone receiver employed by an operator at a central station, and composed of two separate telephone receivers united into one common frame or receptacle with a single ear-piece, for the purpose of affording a separate distinct circuit and diaphragm, independently of the speaking circuit and diaphragm.

**Compound Telegraph-Wire.**—A bimetallic telegraph wire.

**Compound Winding.**—A method of winding dynamos or motors in which both shunt and series coils are placed on the field magnets.

**Compound-Wound.**—(1) Having associated shunt and series windings. (2) Compositely wound.

**Compound-Wound Alternator.**—An alternator whose fields are compound-wound.

**Compound-Wound Continuous-Current Generator.**—A continuous-current generator whose fields are compound-wound, for the purpose of maintaining the pressure constant under all loads.

**Compound-Wound Field.**—A field provided with compound windings.

**Compound-Wound Motor.**—A motor whose field is compound wound, for the purpose of maintaining its speed constant under all loads.

**Compound-Wound Voltmeter.**—(1) A compensated voltmeter. (2) A voltmeter having more than one winding.

**Concealed Wiring.**—Interior wiring

placed out of sight, and either built in the plaster of a room or carried through suitable conduits placed therein.

**Concentration of Lines of Force.**—Any increase in the intensity of a magnetic flux.

**Concentration Throw.**—The deflection of a magnetic needle by a current, produced under certain circumstances by a couple formed of plates of iron or other paramagnetic metal, when exposed to chemical action while in a magnetic field.

**Concentric Cable.**—(1) A cable provided with both a leading and return conductor insulated from each other, and forming respectively the central core or conductor, and the enclosing tubular conductor. (2) A cable having concentric conductors.

**Concentric-Carbon Electrodes.**—Concentric-carbon electrodes employed in a modified form of Jablchokoff candle.

**Concentric Conductors.**—Cylindrical coaxial conductors insulated from each other.

**Concentric-Cylindrical Carbons.**—A cylindrical rod of carbon placed inside a hollow cylinder of carbon, but separated from it either by an air space, or by some refractory insulating material, employed in a form of Jablchokoff candle.

**Concentric Mains.**—Mains employing concentric cables.

**Concentric Wiring.**—Wiring by means of concentric cables.

**Condensance.**—Capacity reactance.

**Condenser.**—(1) A device for increasing the capacity of an insulated conductor by bringing it near another earth-connected conductor but separated therefrom by any medium that will permit electrostatic induction to take place through its mass. (2) Any variety of electrostatic accumulator.

**Condensor Capacity.**—The capacity of a condenser.

**Condenser Circuit.**—Any circuit in which a condenser is inserted.

**Condenser Lightning-Arrester.**—A form of lightning arrester whose operation depends on the connection of a condenser with some part of the circuit to be protected.

**Condenser Pressure.**—The difference of potential at the terminals of a condenser.

**Condenser Rheostat.**—A rheostat in the circuit of a condenser in an artificial line of a duplex or quadruplex system.

**Condenser Signalling.**—Any form of

telegraphic or telephonic signalling in which condensers are employed.

**Condenser Working.**—Condenser signalling.

**Condensing Electroscope.**—An electroscope provided with a condenser for the purpose of rendering evident feeble charges.

**Conduct.**—(1) To pass electricity through conducting substances. (2) To carry, or to possess the power of carrying, an electric current.

**Conductance.**—(1) A word sometimes used in place of conducting power. (2) The reciprocal of resistance. (3) In a continuous-current circuit the ratio of the current strength to the E. M. F. (4) In an alternating current circuit the quantity whose square added to the square of the susceptance is equal to the square of the admittance.

**Conductance, Electric.**—Conducting power for electricity.

**Conductance Leak.**—A leak in a cable or circuit produced by conduction as distinguished from a leak possessing induction.

**Conductibility.**—(1) Possessing the power of conducting electricity. (2) Conductivity.

**Conducting Cord.**—A small insulated flexible cable usually consisting of a stranded conductor or conductors.

**Conducting Cord Tip.**—A blunted or rounded conductor placed at one of the ends of a cord or wire for the purpose of readily inserting it into a binding post or into a plug hole.

**Conducting Loop.**—A loop of wire or other electric conductor.

**Conducting Power.**—The ability possessed by a given length and area of normal cross-section of a substance for conducting light, heat, electricity, or magnetism, as compared with that possessed by an equal length and area of normal cross-section of some other substance taken as a standard.

**Conducting Power for Electricity.**—The ability possessed by a given length and area of normal cross-section of a substance to conduct electricity as compared with that possessed by an equal length and area of normal cross-section of some other substance taken as a standard, such, for example, as pure copper.

**Conducting Power for Heat.**—The ability possessed by a substance to transmit heat through its mass.

**Conducting Power for Lines of Magnetic Force.**—(1) Permeability. (2) Inductivity.

**Conduction Current.**—The current that passes through a metallic or other conducting substance, as distinguished from one produced in a non-conductor or dielectric.

**Conduction, Electric.**—(1) The so-called flow or passage of electricity through a metallic or other similar substance. (2) The ability of a substance to determine the direction in which electric energy shall be transmitted through the ether surrounding it. (3) The ability of a substance to determine the direction in which a current of electricity shall pass from one point to another.

**Conduction Lightning-Protection.**—The protection of any instrument from the passage of a current due to lightning through its coils.

**Conduction Lightning-Protector.**—A lightning protector by means of which a current is prevented from passing through the coils of a galvanometer, or other needle instrument, and thus injuriously disturb the magnetism of the needle.

**Conduction Resistance.**—The resistance offered by a conductor to an electric current.

**Conductive.**—Possessing the power of conducting.

**Conductive Discharge.**—A discharge effected by leading the charge off through a conductor placed in contact with the charged body, as opposed to a convective or disruptive discharge.

**Conductivity, Electric.**—(1) The reciprocal of electric resistivity. (2) The conductance of a substance referred to unit dimensions.

**Conductivity Resistance.**—The resistance offered by a substance to electric conduction, or to the passage of electricity through its mass.

**Conductor.**—(1) Any substance which will permit the so-called passage of an electric current. (2) A substance which possesses the ability of determining the direction in which electric energy shall pass through the ether in the dielectric surrounding it.

**Conductor Resistance.**—A term frequently employed for copper resistance.

**Conductor System.**—A network of interconnected conductors employed for distributing electricity.

**Conduit Cables.**—A cable conductor or set of conductors laid in a conduit.

**Conduit Conductors.**—Conductors intended for use in underground circuits, provided with an insulation suitable to maintain the electric integrity of the separate circuits.

**Conduit, Electric.**—An underground space, either single or provided with a number of separate spaces called ducts, employed for the reception of electric wires or cables.

**Conduit Trolley-System.**—A single or double-trolley system in which the trolley wire or wires are placed in an underground slotted conduit, the trolley wheel being replaced by a plow or sled pushed or drawn through the slot.

**Coned Plunger for Electromagnetic Solenoid.**—A cone-shaped core, employed in connection with a solenoid instead of the ordinary cylindrical core, for the purpose of obtaining a comparatively uniform pull through a fairly extended movement of the core.

**Conflict, Electric.**—A term proposed for the magnetic field surrounding an active conductor.

**Congelation.**—The act of freezing, or the change of a liquid into a solid on loss of heat.

**Conical Conductor.**—(1) A cone-shaped conductor, which gradually increases or decreases in diameter, thus assuming the form of a tapering cone, employed to obtain an approximately constant current density through a system of parallel distribution. (2) In practice, a cylindrical conductor that tapers by sections, the diameter being reduced in each succeeding length.

**Conjoined E. M. F.'s.**—A number of electromotive forces simultaneously acting in one circuit.

**Conjugate Coils.**—Two coils whose conductors are conjugate to each other.

**Conjugate Conductors.**—(1) In a conducting network, two conductors so related that the introduction of an E. M. F. in one produces no current in the other. (2) Two conductors so placed as regards each other that an interruption of the current in one, produces no induced current in the other.

**Conjugate Functions.**—The real and imaginary components of a function of a complex variable.

**Connect.**—To place or bring into electric contact.

**Connecting.**—Placing or bringing into electric contact.

**Connecting Bars.**—Metallic bars at a call-wire multiple-switchboard, for connecting the operator's set with the call-wire jacks through a cord.

**Connecting In "Bridge."**—A phrase sometimes employed for connecting in multiple arc or parallel.

**Connecting Jack.**—A jack for introducing a loop into a telephone circuit.

**Connecting Peg.**—A metallic block for bridging an air gap and so making an electric connection.

**Connecting Screws.**—A term sometimes employed indifferently for connectors or for binding posts.

**Connecting Side of Telephone Switchboard.**—That side of a telephone switchboard at which connections are made with subscribers wanted, as distinguished from the side at which calls are received.

**Connecting Sleeve.**—A metallic sleeve employed as a connector for readily joining the ends of two or more wires.

**Connecting-Up.** (1) In telegraphy, joining up. (2) The operation of establishing an electric circuit.

**Connection.**—The act of placing in electric or magnetic contact.

**Connection Board of Transformer.** A board usually located in an accessible place in a transformer case, and provided with binding posts for conveniently making or changing the connections of the transformer coils with the external circuits.

**Connection for Intensity.** A phrase formerly employed for connection in series. (Nearly obsolete.)

**Connection for Quantity.**—A phrase formerly employed for connection in multiple. (Nearly obsolete.)

**Connection in Cascade.**—A term sometimes employed for connection in series.

**Connection in Sequence.**—A term sometimes used for connection in series.

**Connection of Battery for Intensity.** A term formerly employed for the series-connection of the cells in a battery. (Obsolete.)

**Connection of Battery for Quantity.**—A term formerly employed for a multiple or parallel connection of the cells in a battery. (Obsolete.)

**Connector.**—A device for readily connecting or joining the ends of two or more conductors.

**Conning Tower.**—A shell-proof tower from which the commander on a turreted



war-ship directs its movements when in action.

**Consequent Points.**—The points or places in an anomalous magnet where its consequent poles are situated.

**Consequent Pole.**—(1) A magnet pole formed by two free north or two free south poles placed together. (2) A magnet pole developed at some point of a magnet other than its extremities.

**Consequent Poles of Dynamo.**—(1) Dynamo poles formed by the juxtaposition of two similar magnetic poles. (2) Dynamo poles developed at polar projections unprovided with magnetizing coils.

**Consequent Resistance.**—A term proposed for the apparent resistance of a conductor traversed by alternating currents, as modified by the skin effect, and as distinguished from its ohmic resistance or its inductive resistance.

**Conservation of Energy.**—(1) A term indicative of the fact that energy can never be annihilated, so that if it disappears in one form, it must reappear in some other form. (2) The indestructibility of energy.

**Consonance.**—(1) A phase agreement between two simple-periodic waves or vibrations. (2) The reinforcement of sound waves, or their increase in intensity, by means of vibrating bodies that are not in resonance with, or are tuned to vibrate in unison with, the sounding body. (3) Forced unison.

**Consonance, Electric.**—In an alternating-current circuit the co-phasing of the impressed E. M. F. with the primary current, due to the influence of capacity in an inductively associated secondary circuit.

**Consonant Electric Circuit.**—(1) An alternating-current circuit containing resistance and inductance, and inductively associated with a secondary circuit containing resistance, inductance, and capacity, in such a manner that the secondary inductance and capacity neutralize the inductance of the primary circuit. (2) A primary alternating-current circuit devoid of reactance or choking effect, owing to the presence of a condenser in a secondary circuit, as distinguished from the effect of a condenser inserted in the primary circuit directly.

**Consonator.**—Any body capable of reinforcing sound by consonance.

**Constant.**—Possessing an invariable value.

**Constant Cell.**—Any voltaic cell which under certain circumstances, is capable of furnishing a constant electromotive force and current.

**Constant Current.**—(1) A direct current or one that always flows in the same direction. (2) A current whose strength is unvarying.

**Constant-Current Alternating-Current Dynamo.**—An alternator which supplies a constant effective current strength in its circuit.

**Constant-Current Arc-Lamp.**—A series-connected arc-lamp.

**Constant-Current Circuit.**—A circuit whose current strength is maintained constant notwithstanding changes in its resistance.

**Constant-Current Dynamo.**—A constant-current generator.

**Constant-Current Generator.**—A term applied to a generator intended to produce a constant strength of current despite changes in its load.

**Constant-Current Transformation.**—A change or transformation in the strength of a constant current.

**Constant-Current Transformer.**—(1) A transformer which is intended to raise or reduce a current strength in a given constant ratio. (2) A transformer designed to maintain a constant strength of current in its secondary circuit, despite changes of load.

**Constant Inductance.**—(1) The inductance of a circuit immersed in or wholly surrounded by a material of constant magnetic permeability. (2) An inductance which does not vary with the current strength.

**Constant-Potential Alternating-Current Dynamo.**—(1) An alternator which supplies a constant effective pressure at its terminals. (2) A compounded alternator.

**Constant-Potential Arc-Lamp.**—An arc lamp employed on constant-potential or incandescent mains.

**Constant-Potential Circuit.**—(1) A circuit whose potential is maintained approximately constant. (2) A multiple or parallel-connected circuit.

**Constant-Potential Dynamo.**—(1) A dynamo that furnishes an approximately constant difference of potential or electromotive force despite changes in its resistance or load. (2) A shunt or compound-wound dynamo.

**Constant-Potential Generator.**—A constant-potential dynamo.



**Constant-Potential Motor.**—(1) A motor designed for operation by means of a constant-potential current. (2) Generally, a shunt-wound or compound-wound motor.

**Consumer.**—One who receives electric supply.

**Consumer's Terminals.**—In a system of electric distribution the terminals of a house service, the property of the house, and at which the electric supply is delivered by the supply company.

**Consumption Circuit.**—Any circuit in which an electro-receptive device is placed.

**Contact Breaker.**—A device for breaking or opening an electric circuit.

**Contact Electromotive Force.**—Electromotive force produced by the mere contact of dissimilar metals.

**Contact Electricity.**—Electricity produced by contact electromotive forces.

**Contact Force.**—A contact electromotive force.

**Contact Lamp.**—A name sometimes given to a semi-incandescent lamp.

**Contact Resistance.**—Resistance produced at the contact of two or more surfaces.

**Contact Ring of Telephone Plug.**—A plug in a multiple telephone switchboard carrying an insulated metal ring or sleeve establishing a circuit for the busy test.

**Contact Rings of Alternator.**—The collector rings of an alternator.

**Contact Series.**—A series of metals arranged in such an order that each becomes positively electrified by contact with the one that follows it.

**Contact Screw.**—A screw the end of which is provided with a platinum or other contact, employed to close the circuit of any electric device in whose circuit it is placed.

**Contact Theory of Electricity.**—A theory that ascribes the production of electromotive forces, or of electricity, to the contact of dissimilar substances or surfaces.

**Contact Theory of Voltaic Cell.**—The contact theory of electricity applied to the production of electricity in a voltaic cell.

**Contacts.**—(1) Conducting pieces or plates introduced into electric circuits at points where it is desired to open and close the circuit. (2) A variety of fault occasioned in any circuit by the accidental contact of any part of the circuit with a conducting body. (3) A metallic cross or faulty

connection between two telegraphic or telephonic circuits.

**Containing Cell.**—(1) A jar provided for holding or containing the solution or electrolyte employed in connection with a primary or secondary voltaic couple. (2) A jar or receptacle for containing any liquid or solution, as in an electro-plating bath.

**Continental Telegraphic-Code.**—A telegraphic-code employed in Europe generally.

**Continuator.**—A constant-current dynamo. (Not in use.)

**Continuity of Circuit.**—The uninterrupted conducting condition of a circuit.

**Continuity-Preserving Transmitter.**—A transmitter employed in duplex telegraphy, so arranged that the line wire may be transferred from the battery to the earth without any break in the continuity of the circuit.

**Continuous-Alternating Transformer.**  
(1) A secondary generator for transforming continuous into alternating currents.  
(2) A dynamotor, motor-dynamo, or rotary transformer.

**Continuous Current.**—(1) An electric current which flows in one and the same direction. (2) A direct current.

**Continuous-Current Arc.**—A voltaic arc produced by a continuous current, as distinguished from one produced by alternating currents.

**Continuous-Current Armature-Windings.**—Armature windings suitable for use in continuous-current generators.

**Continuous-Current Dynamo-Electric Machine.**—A continuous-current generator.

**Continuous-Current Generator.**—Any generator capable of furnishing continuous currents.

**Continuous-Current Motor.**—A motor operated by continuous or direct currents.

**Continuous-Current Transformer.**—(1) A dynamotor or motor-dynamo. (2) A transformer from one continuous pressure and current to another.

**Continuous E. M. F.'s.**—Electromotive forces whose direction and value remain constant.

**Continuous-Sounding or Ringing Electric-Bell.**—(1) An electric bell, which on completion of its circuit continues sounding until stopped. (2) A trembling bell.

**Continuous Spectrum.**—(1) A luminous spectrum that is devoid of the Fraunhofer

dark lines, or which contains all the physiologically effective luminous frequencies. (3) The spectrum of a sufficiently heated incandescent solid.

**Continuous-Surface Commutator.**—A dynamo commutator, whose surface contains no breaks in the gaps between contiguous commutator bars; *i. e.*, whose gaps are filled with an insulating material instead of being left with air spaces.

**Continuous Trolley Wire.**—An unjointed trolley wire.

**Continuous Winding.**—A term frequently employed for wave winding or undulatory winding of an armature.

**Continuous Wire or Conductor.**—An unjointed wire or conductor.

**Continuously Insulated Cable.**—A length of cable extending continuously between two points without any taps.

**Contracting Magnetic Whirls.**—Magnetic whirls which are decreasing or moving in towards the electro-magnet or circuit producing them.

**Contractures.**—In electro-therapeutics prolonged muscular spasms or tetanus caused by the passage of electric currents.

**Contraplex Telegraph.**—A general term embracing the apparatus employed in contraplex telegraphy.

**Contraplex Telegraphy.**—Duplex telegraphy in which transmissions are simultaneously made from opposite ends of the line.

**Controlled Clock.**—A clock whose works are controlled or regulated either entirely or partially, by an electric current.

**Controller.**—(1) The magnet employed in a system of automatic constant-current regulation, whose coils are traversed by the main current, employed automatically to throw a regulator magnet into or out of the main circuit on changes of the current passing. (2) Any electric mechanism for controlling a circuit or system. (3) An electric switching mechanism for controlling the speed of a motor or motors. (4) A street-railway car-controller.

**Controller Resistance.**—Resistance employed in connection with street-car controllers for starting or stopping the motors, or for varying their speed.

**Controller Switch.**—(1) The switch operating the switch cylinder of a street-car controller. (2) Any switch employed in connection with a street-car controller.

**Controlling Box.**—The box holding any controlling rheostat or controller.

**Controlling Block, Electric.**—In a system of trolley telegraphy, the master clock

whose impulses move or regulate the secondary clocks.

**Controlling Magnet.**—(1) Any magnet which controls some particular action, as, for example, the attraction of a needle in a galvanometer. (2) A name sometimes given to the controller in an automatic system of current regulation.

**Controlling Stand.**—The support or stand provided for holding the apparatus employed for controlling a motor.

**Convection Currents.**—Currents produced by the bodily carrying forward of static charges in convection streams.

**Convection, Electric.**—The air streams which are thrown off from points on the surface of a charged insulated conductor.

**Convection of Heat, Electric.**—(1) A term employed to express the dissymmetrical distribution of temperature that occurs when an electric current is sent through a metallic wire, the middle of which is maintained at one constant temperature, and the ends at another constant temperature. (2) Distribution of heat which attends the passage of an electric current through an unequally heated conductor.

**Convection Streams.**—Streams of electrified air, or other gaseous or vaporous particles, given off from sharp points on the surface of highly charged insulated conductors.

**Convection Transference.**—The transference of electricity by means of convection streams.

**Convective Discharge.**—The discharge which occurs from the points of a highly charged conductor, through the electrostatic repulsion of similarly charged air particles, which thus carry off minute charges.

**Converging Magnetic Flux.**—Magnetic flux that converges or radiates from a point or points.

**Conversion of Electromotive Force.**—Any increase or decrease in the value of an electromotive force produced by means of a transformer.

**Convert.**—To transform or change an electromotive force or current.

**Converted Currents.**—Electric currents whose strengths have been increased or decreased by means of a transformer.

**Converter.**—A name sometimes given to a transformer.

**Converter Bracket.**—(1) A bracket for holding a pair of insulators and a single light converter and shunt box in an alternating current series system of street light

ing. (2) A bracket for supporting an alternating-current converter.

**Converter Fuse.**—A safety fuse connected with the circuit or circuits of a converter or transformer, and usually mounted in the transformer case.

**Converting.**—Transforming or changing an electromotive force or current.

**Converting Currents.**—(1) Changing the value of the current strength by means of transformers. (2) Changing a continuous into an alternating current, or vice versa.

**Converting Station.**—(1) A transforming station. (2) A station containing transformers.

**Convayor, Electric.**—An electrically operated or controlled system of transporting material.

**Convolutions of Wire.**—The separate loops or turns in a helix or coil.

**Cooling-Box of Hydro-Electric Machine.**—A box provided in Armstrong's hydro-electric machine for the steam to pass through before leaving the nozzle.

**Cooling Surface.**—The surface from which a hot body can dissipate its heat energy.

**Cooling Surface of Armature.**—That portion of an armature surface from which it can dissipate into the surrounding air the heat energy produced in it by the passage of the currents generated during its rotation.

**Cooling Tubes.**—Tubes inserted in the frame or casing of an alternating-current transformer for the supply of cold water from an external pump or source.

**Co-Periodic.**—Possessing the same periodicity.

**Co-Periodic E. M. F.'s, Currents or Fluxes.**—Electromotive forces, currents or fluxes, possessing the same periodicity.

**Co-Phasal.**—Possessing the same phase.

**Co-Phasal Alternations.**—Alternations possessing the same phase.

**Co Phase.**—(1) Coincidence in phase of co-periodic motions. (2) Such a phase relation between two periodic but non-co-periodic quantities as tends to increase the amplitude of the motion.

**Copper Arc.**—An arc formed between copper electrodes.

**Copper Bath.**—An electrolytic bath containing an electrolyzable solution of a copper salt, and a copper plate forming the anode, and placed in an electrolyte near the object to be electroplated, which forms the cathode.

**Copper Battery.**—A battery employed in sending copper currents to line.

**Copper Conductivity Standard.**—(1) According to rules of the British Institution of Electrical Engineers, a metre-gramme wire of standard conductivity, whose resistance is 0.1513 international ohm at 15 C., corresponding to Matthiessen's standard for hard copper. (2) According to a committee of the American Institute of Electrical Engineers, a copper metre-gramme, of Matthiessen standard soft copper conductivity, whose resistance is 0.1501 ohm at 15 C.

**Copper Connector.**—(1) A particular form of connector employed in the gravity voltaic cell for connecting the copper element to the circuit wire or conductor. (2) A special form of clasper for connecting large wires or conductors.

**Copper Current.**—A term sometimes used in telegraphy for a positive current.

**Copper Efficiency.**—The ratio of the electric energy delivered by a copper conducting system, to the energy delivered to that system.

**Copper Fuse-Wire Terminals.**—Copper terminals provided for connection with the terminals of fuse wires or safety catches.

**Copper Heat.**—The heat which appears in a copper conductor due to the passage through it of an electric current.

**Copper-Lead Accumulator.**—An accumulator or storage battery consisting of plates of copper and lead immersed in a solution of copper sulphate.

**Copper Loss.**—The total loss of energy produced by the passage of a current through the copper wire of a dynamo, motor, or conducting system generally.

**Copper Magnetic Circuit.**—That portion of a magnetic circuit which is completed through copper.

**Copper Plating.**—Electro-plating with copper.

**Copper Resistance.**—In submarine telegraphy, conductor resistance.

**Copper Resistivity.**—The specific resistance of copper of Matthiessen soft copper standard referred to the resistance of a cube one centimetre in length of edge, such a cube offering between parallel faces a resistance of 1.584 microhms at 0° C. (2) The resistivity of a copper wire.

**Copper Ribbon.**—A variety of strip copper.

**Copper Shell of Electro-Type.**—The thin electrolytic deposit of copper which, when stiffened by the backing metal and



suitably incanted on a block, forms the electro type.

**Copper Strap.**—Copper conductors in the form of straps or flat bars.

**Copper Tape.**—Rectangular straps or bars of copper employed for armature windings.

**Copper Voltmeter.**—A voltmeter whose indications are dependent on the electrolysis of a solution of a copper salt.

**Copper-Zinc Accumulator.**—An accumulator or storage cell consisting of a plate of copper and a plate of zinc immersed in a solution of zinc sulphate.

**Coppered Arc-Light Carbons.**—Carbons employed in arc-lamps, covered electrolytically with copper.

**Coppered Carbons.**—Carbons for arc-lamps, or batteries, that are electrolytically coated with copper.

**Coppered Plumbago.**—Powdered plumbago coated with copper for use in the metallization of objects to be electrolyzed.

**Copying Telegraph.**—A fac-simile or automatic telegraph.

**Cord Adjuster.**—A device for adjusting the length of a pendant cord.

**Cord, Electric.**—A flexible, insulated electric conductor, generally containing two parallel wires.

**Cord Peg.**—A cord to which a connecting peg is attached.

**Cord-Peg Connection.**—Connection in a switchboard by means of a cord peg.

**Cord Pendant.**—A flexible or stranded conductor employed for a lamp pendant.

**Cord Shelf.**—A shelf provided for the holding of the cord pegs of a telephone switchboard.

**Core Discs.**—Stampings or cuttings of sheet iron, employed, when suitably assembled, for the laminated core of a dynamo or motor armature, or other dynamo-electric apparatus.

**Core Losses.**—The hysteresis and the Foucault or eddy-current losses of the core of a dynamo, motor, or transformer.

**Core Losses of Transformer.**—(1) The hysteresis and Foucault-current losses in the core of a transformer. (2) The iron losses in a transformer.

**Core of Cable.**—(1) The insulated wires employed for the transmission of the current through a conducting cable. (2) The electric conductor and insulator as distinguished from the mechanical serving and sheathing of a cable.

**Core Pins of Magnet.**—Pins in the core of a magnet for securing their firm mechanical union with the yoke.

**Core Ratio of Cable.**—The ratio between the diameter of the core of a cable and the mean diameter of the conductor strand.

**Core Transformer.**—(1) A transformer in which the iron forms the core or central portion on which the wire windings are placed. (2) A transformer possessing a core capable of insertion or removal.

**Cored Carbons.**—Arc-light carbons provided with a soft centre of carbon.

**Cored Electrodes.**—Cored arc-light carbons.

**Coreless.**—Devoid of a core.

**Coreless Armature of Dynamo or Motor.**—An armature of a dynamo or motor unprovided with the usual core of iron.

**Corn-Plaster Fuse.**—A strip of fusible metal rolled up with an asbestos tape in the form of a cylinder and employed as a safety catch in a telephone switchboard.

**Cornice Bracket.**—A form of insulator bracket for use on the under side of cornices.

**Corposant.**—A name sometimes given by sailors to the St. Elmo's fire.

**Coronæ.**—(1) Crown-shaped masses of light sometimes seen during the prevalence of aurora. (2) Auroral coronæ.

**Corpuscle.**—(1) An ultimate particle in an assumed highly tenuous substance that was formerly believed to be emitted by highly heated bodies. (2) Any of the ultimate particles of the matter into which it has been assumed that the ultimate elementary atoms may be divided.

**Correcting Factor of Wattmeter.**—The correction which must be applied to the readings of an alternating current wattmeter when the reactance in its shunt circuit cannot be neglected.

**Correcting Relay.**—(1) A relay employed in the Delaney system of synchronous-multiplex telegraphy to aid in obtaining synchronism. (2) In a quadruplex system, a relay intermediate between the polarized receiving relay and its sounder, for the purpose of preventing false signals or kicks.

**Correlation of Energy.**—A term sometimes applied to the different phases under which energy may appear.

**Corrugated Reflector.**—A reflector formed of silvered corrugated glass.

**Cosine.**—(1) One of the trigonometrical functions. (2) The ratio of the base to



the hypotenuse of a right-angled triangle in which the hypotenuse is the radius vector, and the angle between the base and hypotenuse the angle whose cosine is considered.

**Cosine Law of Illumination.**—The intensity of illumination, of a surface illumined by a single-point source, varies as the cosine of the angle of the rays incident upon the surface from that source.

**Cosinusoid.**—A curve of cosines.

**Cotangent.**—(1) One of the trigonometrical functions. (2) The reciprocal of the tangent of an angle.

**Coulomb.**—(1) The practical unit of electric quantity. (2) Such a quantity of electricity as would pass in one second through a circuit conveying one ampere. (3) The quantity of electricity contained in a condenser of one farad capacity, when subjected to the E. M. F. of one volt.

**Coulomb Meter.**—A meter for measuring in coulombs, the quantity of electricity which passes through any circuit.

**Coulomb's Electric Balance.**—A torsion balance for measuring the forces of electric or magnetic repulsion.

**Coulomb's Torsion Balance.**—An apparatus for measuring the force of electric or magnetic repulsion between two similarly charged bodies, or between two similar magnet poles, by opposing to such forces the torsion of a thin wire.

**Coulomb-Volt.**—A word sometimes employed for the volt-coulomb or joule.

**Counter-Clockwise Motion.**—A rotary motion whose direction is opposed to that of the hands of a clock, as viewed from the clock face.

**Counter Communication Telephone Switch.**—A switch arranged in a telephone system in connection with a silence cabinet, whereby a person occupying the cabinet is unable to call up the exchange without the sanction and assistance of an attendant in the office outside the cabinet.

**Counter, Electric.**—(1) A device for counting and registering such quantities as the number of fares collected, gallons of water pumped, sheets of paper printed, votes polled, revolutions of an engine per second, etc. (2) Any counting device operated or controlled by electricity.

**Counter Electro-Dynamic Force.**—The electro-magnetic force which is set up in a dynamo armature opposing the impressed driving force.

**Counter-Electromotive Force.**—(1) An opposed or reverse electromotive force which tends to set up a current in the opposite direction to that actually produced by a source. (2) In an electric motor, an electromotive force produced by the rotation of the armature and opposed to that produced by the driving current.

**Counter-Electromotive Force Cell.**—(1) An electrolytic cell inserted in the charging circuit of a storage battery to reduce the charging current strength, usually composed of opposed plates or grids of antimonious lead from the surfaces of which gases are disengaged by electrolysis. (2) Additional cells, generally without active material, employed with a storage battery which has to be charged at a pressure above the normal pressure, and inserted between the dynamo and the mains to maintain their pressure normal.

**Counter-Electromotive Force Lightning-Arrester.**—(1) A lightning-arrester in which the passage of a discharge through the instruments to be protected is opposed by a counter electromotive force generated by induction on the passage of the lightning discharge. (2.) A choking-coil lightning-arrester.

**Counter-Electromotive Force of Arc.**—An electromotive force produced during the formation of a carbon voltaic arc opposed to that which maintains the arc.

**Counter-Electromotive Force of Convective Discharge.**—Resistance to the passage of an electric discharge through a high vacuum, somewhat of the nature of a counter electromotive force.

**Counter-Electromotive Force of Electrolysis.**—A counter electromotive force produced by electrolysis in the plating bath of an electrolytic cell.

**Counter-Electromotive Force of Induction.**—The counter electromotive force of self or mutual induction.

**Counter-Electromotive Force of Mutual Induction.**—(1) Counter-electromotive force produced by mutual induction between neighboring circuits. (2) Counter-electromotive force in the primary circuit of a transformer produced by the mutual induction from the current in the secondary circuit.

**Counter-Electromotive Force of Polarization.**—Electromotive force developed in a voltaic cell or plating bath by polarization, and opposed to that which produces the current of the cell.

**Counter-Electromotive Force of Self-Induction.**—The counter-electromotive

force produced in the primary circuit of an induction coil by the action thereon of an alternating electromotive force.

**Counter-Electromotive Force of Self-Induction of the Primary.**—The counter-electromotive force produced in the primary circuit of a transformer by the action of induction of the primary current on itself, as distinguished from that produced by mutual induction from the secondary current.

**Counter-Electromotive Force of Self-Induction of the Secondary.**—The counter-electromotive force produced in the secondary by periodic variations in the effective electromotive force in the secondary circuit.

**Counter-Electromotive Force of Storage Battery.**—The electromotive force in a storage battery which opposes the electromotive force employed in charging.

**Counter Electromotive Force of Voltaic Cell.**—The counter-electromotive force in a voltaic cell due to its polarization.

**Counter Inductive Effect.**—An opposal of current or charge by means of an electromotive force produced by induction.

**Counter Pressure.** A term sometimes used for counter-electromotive force.

**Couple**—(1) In mechanics, two equal and parallel, but oppositely directed forces, acting in the same line, and tending to produce rotation. (2) The two elements in a voltaic cell or thermo-electric cell.

**Coupled Cells.** A number of separate cells so connected or coupled as to form a battery or single electric source.

**Coupling Box for Electric Tubes.**—A box provided for the ready connection of the conductors in the separate lengths of underground electric tubes.

**Coupling Clamp for Underground Conductors.**—An electric coupling between two lengths of underground conductors.

**Coupling Joint for Underground Tubing.**—A joint for the separate conductors in an underground tubing, consisting generally of a flexible conductor and connectors for ready attachment to the ends of the conductor.

**Coupling of Voltaic Cells or Other Electric Sources.**—Connecting a number of separate voltaic cells, or other separate electric sources, so as to enable them to act as a battery or single electric source.

**Coupling Transformer.**—A transformer which employs polyphasal coupling of magnetic circuits.

**Cradle Dynamometer.**—A dynamometer in which the dynamo to be tested is supported in a cradle, and the mechanical energy it receives or transmits is measured by the torque developed by the cradle about its axis.

**Cradle Suspension of Street-Car Motor.**—A method of supporting a car motor on its truck upon a cradle.

**Crater in Positive Carbon.**—A depression in the end of the positive carbon arc-lamp, which occurs after the lamp has been maintained for some little time.

**"Creep" of Belt.** A term sometimes used for the slip of a belt.

**Creepage.** The residual elastic force in a suspension fibre.

**Creeping, Electric.** A term sometimes applied to the creeping of a current.

**Creeping in Voltaic Cell.** The formation by efflorescence of salts on the surface of the porous cup of the voltaic cell, binding posts, or on the walls of the vessel containing the electrolyte.

**Creeping of Belt.** (1) An action of a driving belt due to its retractility, when the driving pulley travels somewhat faster than the driven pulley. (2) Belt slip.

**Creeping of Current.**—(1) A term sometimes employed for a change in the direction of the path of a current from a line between the points of connection to the source. (2) Electrification or polarization currents in an electrolyte, or extension of a glow or streamer discharge over the surface of a dielectric.

**Creosoting.** A process employed for the preservation of wood, such, for example, as telegraph poles, by injecting creosote into the pores of the wood.

**Crevasse.** A narrow gap or slit, or an imagined, in a magnet or magnetic substance, for the purpose of detecting the magnetic forces on a small needle.

**Crith.**—A proposed unit of mass, equal to the weight of one litre or cubic decimetre of hydrogen at 0° Centigrade, and 760 millimetres barometric pressure.

**Critical Angle.**—The angle of incidence at which a ray of light falling on the surface of a body ceases to be refracted and is wholly absorbed or internally reflected and refracted.

**Critical Current.**—The current at which a certain critical resistance is reached.

**Critical-Current of Dynamo.** The value of the current of a dynamo at

its characteristic curve begins to depart from a nearly straight line.

**Critical-Current of Magnetization.**—

The current strength at which a small increase in the magnetizing current produces a great increase in the magnetization of an iron core.

**Critical-Distance of Lateral Discharge through an Alternative Path.** The distance at which a discharge will take place through an air space of given dimensions, in preference to passing through a metallic circuit of comparatively small ohmic resistance.

**Critical Pressure of a Gas or Vapor.**—

(1) The lowest pressure at which a substance in the liquid state cannot be partially vaporized by increase of temperature, but changes wholly into a gas. (2) The lowest pressure at which a gaseous substance when cooled is condensed to a liquid in the presence of its vapor. (3) The pressure above which no amount of chilling will liquefy a gaseous substance.

**Critical-Speed of Compound-Wound Dynamo.**—

The speed at which both the series and shunt coils of a dynamo give the same difference of potential when the full load is on the machine, as the shunt coil would have if used alone on open-circuit. (2) The speed at which a dynamo commences to build up its excitation.

**Critical Temperature of a Gas or Vapor.**—

(1) The temperature of a vapor at a given pressure above which no pressure, however great, can convert the vapor into liquid. (2) The temperature above which a vapor is essentially a permanent gas.

**Critical Temperature of a Substance.**—

(1) The temperature above which no pressure applied to the substance in the gaseous form will effect liquefaction. (2) The temperature below which a gaseous substance is a vapor, and as such capable of liquefaction by pressure.

**Critical Volume of a Gas or Vapor.**—

The volume of a substance at the critical temperature and pressure.

**Crookes' Dark-Space.**—A dark space surrounding the negative electrode in a cathode space through which electric discharges are passing.

**Crookes' Effect.**—The effect produced in high-vacuum tubes due to the characteristic motions possessed by heated or electrified molecules when in the ultragaseous or radiant state.

**Crookes' Electric Radiometer.**—A radiometer in which the repulsions of the

molecules of the residual atmosphere take place from electrified instead of from heated surfaces.

**Crookes' Layer.**—The dark space or layer enveloping the cathode of an excited Crookes' tube.

**Crookes' Radiometer.**—An apparatus for demonstrating the action of radiant matter in producing motion, from the effects of the reaction of a stream of molecules thrown off from a number of easily moved, unequally heated surfaces.

**Crookes' Tubes.**—(1) Glass tubes containing high vacua, provided with platinum leading-in wires terminating in suitably shaped metallic surfaces, employed in demonstrating the peculiarities of the radiant or ultragaseous condition of matter. (2) A name frequently given to X-ray tubes.

**Cross.**—(1) A connection or contact between two telegraph circuits. (2) A contact between two conductors or circuits which should be insulated from each other.

**Cross-Ampere Turns.**—(1) Ampere turns on a dynamo armature possessing a cross-magnetizing tendency to distort the magnetic field. (2) Ampere turns which tend to produce a cross magnetization, at right-angles to that produced by the field-magnets.

**Cross Arm.**—(1) A horizontal beam attached to a pole for the support of the insulators of telegraph, electric light, or other electric wires. (2) A telegraphic arm.

**Cross-Arm Bolts.**—Bolts employed for attaching the cross-arms to a pole.

**Cross-Arm Brace.** Galvanized iron braces whose ends are respectively connected to the pole and the cross-arm for the purpose of stiffening them.

**Cross Bonding.**—In an electric railway the bonding between the ground feeder and the track for the purpose of ensuring a good conducting return circuit.

**Cross-Connected Dynamo.**—A dynamo the ends of whose armature coils are connected to corresponding segments all around the commutator.

**Cross-Connecting Board.**—In a system of telegraphic or telephonic communication, a board to which the line terminals are run, before entering the switchboard, so as readily to place any line in connection with any desired section of the switchboard.

**Cross-Connecting Conductors.**—(1) The conductors on a cross-connecting board which serve to connect the sections of a



switch-board with the wires leading to a cable. (2) The conductors which connect corresponding commutator segments in a cross-connected armature.

**Cross-Connecting Telephone Switch-board.**—A telephone distributing board.

**Cross-Connecting Trough.**—A trough dividing a telephone test board from a distributing board, formed for holding the joints in the cross-connections between them.

**Cross-Connection of Armature Windings.**—Armature windings in which the wires are interconnected at the corresponding segments of the commutator.

**Cross-Connection of Commutator.**—The interconnection of the armature coils to corresponding commutator segments.

**Cross Current.**—Current passing between the armatures of alternating current generators, or motors, operated in parallel, and due to differences in the phase or magnitude of the E. M. F.s. in the machines.

**Cross Fire.**—(1) A term employed in telephony or telegraphy for an escape or leakage of current from one line to another, due to defective insulation. (2) Cross talk.

**Cross, Electric.**—(1) A connection, generally metallic, accidentally established between two conducting lines. (2) A defect in a telegraph, telephone, or other circuit, caused by two wires coming into contact by crossing each other.

**Cross Induction.**—(1) An induction produced by the armature current whose magnetization is at right-angles to that produced by the field. (2) Cross magnetization.

**Cross-Induction of Dynamo Armature.**—Cross magnetization produced by a dynamo armature.

**Cross Magnetization.**—A magnetization set up by the currents circulating in the armature turns, which is at right-angles to the magnetization set up by the field flux.

**Cross-Over Block.**—A device to permit the safe crossing of one wire over another in moulding or cleat wiring.

**Cross System.**—A system of running overhead wires for the purpose of preventing mutual inductive disturbances, which consists in crossing or transposing the position of wires on the pole-arms at suitable intervals, as distinguished from the twist system.

**Cross-Talk.**—(1) Cross-fire conversation over one telephone circuit which is heard in neighboring telephone circuit. (2) In-

terference between neighboring telephone circuits.

**Cross-Wire-Suspension for Arc Lamp.**—Suspension of an arc lamp by means of a pulley and cord, attached to a block and tackle suspended from a suitably supported cross wire.

**Crossing Cleat.**—A cleat so arranged as to permit the crossing of one pair of wires under or over another pair without contact with each other.

**Crossing Frog.**—A frog sometimes employed in place of a trolley cross-over.

**Crossing Wires.**—(1) A device employed in telegraphic circuits whereby a faulty conductor is cut out of the line circuit, by crossing it over to a neighboring unused line. (2) In telegraphy, interchanging sections of wire between two way stations, so as to remove a fault from a circuit or to rearrange a circuit passing through the stations.

**Crow-Foot Zinc.**—A crow-foot-shaped zinc employed in the gravity voltaic cell.

**Crown Telephone Receiver.**—A telephone receiver in which a number of permanent steel magnets are arranged in the form of a crown, all the poles of the same name centring at the soft-iron pole-piece carrying the coil, and the opposite coils being joined to the rim of the diaphragm.

**Crucible, Electric.**—(1) A crucible suitable for electro-metallurgical operations. (2) A crucible in which the heat of a voltaic arc, or of electric incandescence is employed, to perform difficult fusions, to effect the reduction of metals from their ores, or to form alloys.

**Crystal.**—A solid body bounded by symmetrically disposed plane faces.

**Crystalline Electro-Metallurgical Deposit.**—A non-adherent, non-coherent film of electrolytically deposited metal.

**Crystallization.**—Solidification from solution or fusion in definite forms.

**Crystallization by Electrolytical Decomposition.**—Crystalline deposition of various metals by the passage, under certain conditions, of an electric current through solutions of their salts.

**Crystallize.**—To separate from a liquid or vapor in the form of a crystalline solid.

**Crystalloid.**—Those portions of a mixed substance subjected to dialysis, that are capable of crystallization.

**Cryptoscope.**—(1) An apparatus consisting of a fluorescent screen placed at one end of a light-tight pasteboard tube, and



- viewed at the other end through an eyepiece. (2) A fluoroscope.
- Cryptoscopic Screen.**—(1) The screen employed in cryptoscopy. (2) A fluorescent screen.
- Cryptoscopy.**—The art of examining the body by means of a cryptoscope.
- Cube Knot.**—A unit of volume sometimes employed in calculations of insulation resistance of submarine cables.
- Cubic Energy.**—A term sometimes employed for voluminal energy.
- Cup Brush.**—A brush suitably shaped for polishing the interior surface of a cup or other similar surface of an object that is to be electroplated.
- Cupric Electrolysis.**—In electrotherapeutic treatment, electrolysis performed with copper electrodes whereby a salt of copper is carried into the tissues under the anode by cataphoric action.
- Curb Key.**—A telegraphic key employed in curb signalling.
- Curb Sender.**—An automatic transmitter employed in submarine telegraphy, which is operated by a punched paper strip and which sends curved signals into the cable.
- Curb Signalling.**—In cable telegraphy, a system for reducing the effects of retardation and increasing the speed of signalling, by following each signalling current with a definite sequence of reversed currents or earthings.
- Curbed Signals.**—Signals sent by means of a curb key.
- Curbing.**—Employing curb signalling.
- Curl.**—(1) The vector part of the nabla of a vector point-function. (2) The line integral of a vector once around any closed loop, and equal to the surface integral of a related vector passing through the loop. (3) The rotation or spin of a vector point-function. (4) A vector which indicates by its direction the plane, and by its length the magnitude, of the maximum vector rate-of-change of a vector point function in the neighborhood of a given point.
- Current Accumulator.**—Any apparatus in which the strength of an electric current is increased by the motion past it of a conductor, the currents produced in which tend to strengthen and increase the current which causes the induction.
- Current Balance.**—A general name given to a variety of amperé balance which gives readings in various decimals or multiples of amperes, and which determines the strength of current passing through its action on a movable ring or coil placed between two fixed rings or coils.
- Current Calorimeter.**—An electric calorimeter.
- Current Commuter.**—(1) Any device that causes alternating currents to flow in one and the same direction. (2) A commutator.
- Current-Conveying Helix.**—An active helix.
- Current Density.**—(1) The current strength which passes in any part of a circuit, divided by the area of cross-section of that part of the circuit. (2) The ratio of the current strength through any surface of section of active conductor to the area of that surface, assumed perpendicular to the current.
- Current Distribution.**—The spreading or ramification of electric currents through a conducting mass or network.
- Current Direction-Indicator.**—An instrument for insertion in an arc or other circuit to indicate whether the proper direction of current is maintained.
- Current Diverter for Electric Railways.**—A term sometimes given to the rheostat employed in starting and regulating a street-car motor.
- Current Efficiency of Storage Battery.**—The ratio between the total useful electric quantity delivered by a charged storage battery to the working circuit, to the total electric quantity employed in charging the battery.
- Current, Electric.**—(1) The quantity of electricity per-second which passes through any conductor or circuit, when the flow is uniform. (2) The rate at which a quantity of electricity flows or passes through a circuit. (3) The ratio, expressed in terms of electric quantity per-second, existing between the electromotive force causing a current and the resistance which opposes it.
- Current Equalizer for Storage Battery.**—A device for controlling the strength of the charging or discharging circuit of a storage battery.
- Current Filaments.**—A term sometimes employed in place of current streamlets.
- Current Governor.**—(1) A current regulator. (2) Any device, whether automatic or non-automatic, for maintaining constant the current strength in any circuit.
- Current Induction.**—A term sometimes used for voltaic induction.
- Current Meter.**—(1) Any form of current galvanometer. (2) An indicating ammeter or recording ampere-hour meter.

**Current Recording-Meter.**—A recording ammeter.

**Current Retarder.**—A term sometimes employed for rheostat.

**Current Reverser.**—(1) A switch or other apparatus designed to reverse the direction of a current. (2) A current changer.

**Current Rush.**—The impulsive rush of current that occurs when a transformer is first switched on, or connected with, an alternating-current circuit.

**Current Sheet.**—The area of active conducting surface carrying a current considered as though the current existed as a material sheet.

**Current Spiral.**—A conducting helix or spiral provided for the passage of a current.

**Current Streamlets.**—A conception of a series of parallel current streams or current filaments flowing through a solid conductor.

**Current Strength.**—(1) In a direct-current circuit the quotient of the total electromotive force divided by the total resistance. (2) The time-rate-of-flow in a circuit expressed in amperes, or coulombs per second. (3) In an alternating current the quotient of the total electromotive force divided by the impedance.

**Current System of Induction Telegraphy.**—A system of induction telegraphy on railroads, depending on current induction between a fixed circuit along the roadway, and a parallel circuit on the moving train.

**Current Teaser, Electric.**—A coil of thin wire placed on the field magnets of a dynamo-electric machine in addition to the series coils wound thereon, and connected as a shunt across the main circuit.

**Current Transformation.**—(1) The act of changing the strength of a current by changes affected in its electromotive force. (2) The act of changing a direct into an alternating current, or the reverse, or a uniphasic alternating current into a multiphasic alternating current.

**Current Transformer.**—A device for changing in one circuit the strength of current which flows in another.

**Current Turns.**—(1) The product of the number of turns in a coil by the current flowing through them. (2) A word sometimes used for ampere-turns.

**Current Wave.**—(1) The progressive electro-magnetic disturbance in the ether surrounding a conducting wire forming part of a circuit. (2) The progressive disturb-

ance of electric flow traversing a conducting circuit, under the influence of a variation in its impressed electromotive force.

**Current Weigher.**—(1) A current balance. (2) An ammeter in which the electro-magnetic force of the current compared with the earth's gravitational force on a mass.

**Currents of Motion.**—A term sometimes employed in electro-therapeutics for electric currents that are asserted to traverse healthy muscle or nerve tissue during the sudden contraction or relaxation of such muscle and nerve.

**Currents of Rest.**—A term sometimes employed in electro-therapeutics for electric currents that are asserted to traverse healthy muscle or nerve tissue when the muscles are passive.

**Curve Guy-Poles.**—Anchor poles or jacks, employed in an overhead transmission system, placed at a curve or turnout which are attached the wire-guy, employed to preserve the proper tension in the conductor at these points.

**Curve of Sines.**—(1) A curve representing at continuous successive positions successive values of the sines of a progressively varying angle. (2) A sine curve. (3) When drawn to rectangular coordinates, a curve successively rising and falling below the axis of abscissas, responding to the sines of angles turned along said axis.

**Curve of Cross-Over System.**—In a system of transposition for overhead wires in order to avoid the effects of induction, the short bend of wire which effects the transposition at a pole cross-arm.

**Cushioning Chamber.**—In a dead-beat mirror galvanometer, a chamber before or behind a suspended mirror for the purpose of dampening the motions of the latter.

**Cut-In.**—To introduce an electro-receptive device into the circuit of a source of electricity completing or closing the circuit through it.

**Cut-In.**—(1) A term sometimes employed for filament cut-out. (2) An automatic guard cut-out.

**Cut-Off.**—Any device for cutting a battery or other electric source from a circuit or from part of a circuit.

**Cut-Out.**—To remove an electro-receptive device or loop from the circuit of an electric source.

**Cut-Out.**—(1) A device for removing an electro-receptive device or loop from the

circuit of an electric source. (2) A safety fuse.

**Cut-Out Board.**—A board supporting a number of fuse cut-outs.

**Cut-Out Block.**—A block containing a fuse wire or safety catch.

**Cut-Out Box.**—A box containing a cut-out.

**Cut-Out Cabinet.**—Any enclosed space provided in a building for the reception of cut-outs or fuses.

**Cut-Out Switch.**—A short-circuiting switch by means of which an arc-light is cut out from its feeding circuit.

**Cutting and Holding Grapple.**—In submarine telegraphy, a grapple which, after engaging a cable on the sea bottom, automatically grips the cable, and cuts it beyond the grip.

**Cutting Lines of Magnetic Force.**—Passing a conductor through lines of magnetic force or flux, or passing magnetic lines of force or flux through a conductor, so as to cut or intersect such lines or such flux.

**Cycle.**—(1) A succession of events which periodically recur, reckoning from any stage of the disturbance to the moment at which that stage next occurs. (2) A complete recurrence of any periodic change.

**Cycle of Alternations.**—The cycle of a periodically-alternating electromotive force, current or flux.

**Cycle of Magnetization.**—A single complete passage of any magnetic substance through the successive stages of a periodically-recurring magnetic change.

**Cyclic.**—Of or pertaining to a cycle.

**Cyclic Magnetization.**—Magnetization produced in a magnetic substance when subjected to periodic cyclic changes in the magnetizing force.

**Cyclic Magnetic Variations.**—Secular magnetic variations occurring during great cycles of time.

**Cyclic Motion.**—Any motion which recurs in a cycle.

**Cyclic Stability.**—(1) In an alternating-current circuit the condition of uniform periodic motion in alternating quantities, such as pressure and current, attained after a definite number of cycles from the starting of the motion; as distinguished from the variable state of motion when the circuit is first closed. (2) The permanent state in an alternating-current circuit.

**Cyclometer.**—An instrument for recording the number of turns completed by a wheel, shaft, drum, or other rotating device, or for indicating the distance traversed by its periphery.

**Cyclosis.**—The existence of independent cycles in a diagram.

**Cyclotrope.**—A word proposed for transformer or converter. (Not in use.)

**Cylindrical Armature.**—A term sometimes applied to a drum armature.

**Cylindrical Carbon Electrodes.**—Carbon cylinders employed for the electrodes of arc lamps or for battery plates.

**Cylindrical Core.**—(1) A cylindrical-shaped mass of iron employed for the core of a solenoid or helix. (2) A cylindrical-shaped mass of soft carbon employed in cored electrodes.

**Cylindrical Electro-Magnet.**—An electro-magnet whose core consists of a hollow cylinder provided with a slot extending parallel to its axis.

**Cylindrical Magnet.**—A cylindrically shaped magnet.

**Cylindrical Ring-Armature.**—A ring armature whose core has the shape of a long cylinder.

**Cylindrical Vibrator.**—A weight in the form of a cylinder supported by a suspension for the purpose of measuring its torsional rigidity.

**Cymogene.**—An extremely volatile liquid hydrocarbon given off from crude coal-oil during the early stages of its distillation.

**Cystoscopy, Electric.**—The examination of the human bladder by electric illumination.

## D

**d.**—A symbol for diameter.

**D. B. Switch.**—A contraction for double-break switch.

**D. C.**—A contraction for direct current.

**D. E. M. F.**—A contraction for direct-electromotive force.

**"D." Operator.**—A term employed in

mathematics for the operator which effects the total differentiation of a function with respect to time.

**D. P. Cut-Out.**—A contraction for double-pole cut-out.

**D. P. Switch.**—A contraction for double-pole switch.



**D. Q.**—In submarine telegraphy, a signal serving to separate the address from the text of the message.

**Daily Variation of Magnetic Needle.**—The diurnal variation of the magnetic needle.

**Damped Galvanometer.**—A galvanometer whose movable part—i. e., whose needle or coil—when moved, comes to rest as quickly as possible.

**Damped Magnetic Needle.**—A magnetic needle so placed as to come quickly to rest after it has been set in motion.

**Damped Vibrations.**—(1) Vibrations that occur under circumstances in which the vibratory or swinging motions can be at once brought to rest, instead of repeatedly swinging to-and-fro, on the removal of the force causing the vibration. (2) Vibrations of successively diminishing amplitude.

**Dampening Factor.**—The property of an oscillatory alternating-current circuit of diminishing the amplitude of its oscillations owing to the influence of electric resistance or of radiation.

**Damper.**—(1) A metallic cylinder so arranged as to partially or completely surround the iron core of an induction coil for the purpose of varying the intensity of the currents produced in the secondary. (2) A dash-pot, or similar apparatus, provided for preventing the too sudden movements of a lever or other part of a moving device. (3) Any device employed for damping a magnetic needle.

**Damping.**—(1) The act of stopping a sudden vibratory motion without waiting for it to cease after repeated swingings to-and-fro. (2) The act of causing a periodically moving body to lose its energy of motion by the application of retarding forces.

**Damping Coil for Galvanometer.**—(1) An auxiliary coil employed with a galvanometer for receiving transient electric currents from a key under the control of an observer, for the purpose of checking the motion of the needle. (2) A short-circuited coil, on or near a movable electromagnetic system, for the purpose of damping its oscillations by the action of electric currents induced therein.

**Damping, Electric.**—A term sometimes employed for the decrease in the intensity of the electric oscillations produced in a resonant circuit by electric resistance, under circumstances where some of the higher overtones are set up in the circuit.

**Damping Magnet.**—Any magnet employed for the purpose of checking the motions of a moving body or magnet.

**Damping Suspension.**—A suspension which is rendered dead-beat, or aperiodic, by the application of any retarding force or damping mechanism.

**Damping Tube.**—(1) A tube fitted with a glass cup and placed in an instrument to diminish the cavity in which a movable system swings, and thus damp its motion. (2) A conducting tube attached to a movable system and placed in the vicinity of fixed permanent magnets, in order to damp the vibrations of the system.

**Damping Vessel.**—A dash-pot.

**Daniell's Voltaic Cell.**—A zinc-copper couple whose elements are immersed respectively in electrolytes of dilute sulphuric acid and a saturated solution of copper sulphate.

**Dark Discharge.**—A term applied by Faraday to that portion of the convective discharge which occurs, under certain circumstances, in the rarefied gas of an exhausted chamber between the positive and negative electrodes.

**Dark-Light Frequencies.**—Ether vibrations of the nature of light whose frequencies are too low to produce physiologically effective light.

**Dark-Segment of Aurora.**—A dark or non-illuminated portion of an aurora glory, or crown of auroral light.

**Dash-Pot.**—A mechanical device for preventing a too sudden motion in the movable part of any apparatus.

**Day Load.**—A load on an apparatus, machine, or central station, occurring during the daytime as distinguished from a night load.

**Day of Magnetic Disturbance.**—A day during which the mean departure of the reading of a declinometer at any place, from the normal monthly value at that place, is at least one and one-half times the average.

**Daylight Color-Values.**—Such values of luminous frequencies as correspond to those present in ordinary sunlight or daylight.

**Dead-Beat.**—(1) Heavily damped. (2) Aperiodic. (3) Such a motion of a galvanometer needle, or other suspension system, in which the needle moves sharply from point to point and comes quickly to rest.

**Dead-Beat Discharge.**—A non-oscillatory discharge.

**Dead-Beat Galvanometer.**—(1) An aperiodic galvanometer, or one whose needle comes quickly to rest instead of repeat-



ally swinging to-and-fro. (2) A heavily damped galvanometer.

**Dead Beatness.**—Possessing the property of aperiodicity.

**Dead Dipping.**—Dipping in acid liquids for the purpose of obtaining a dead or unpolished surface on an electro-metalurgical coating or deposit.

**Dead Earth.**—(1) A fault in a telegraphic or other line, in which the line is thoroughly grounded or connected with earth. (2) A total earth. (3) An earth of inappreciable or insignificant resistance.

**Dead-Ended Conductor or Wire.**—A conductor or wire whose end is deliberately left open or insulated, as, for example, by being wound around an insulator.

**Dead Ending.**—Leaving a conductor dead-ended.

**Dead Ground or Grounding.**—Such a grounding as will ensure a ground of negligible resistance.

**Dead Man.**—A support for raising a pole and supporting it in place while securing it in the ground.

**Dead Points of Motor Armature.**—Any positions of a motor armature when at rest, in which the driving current cannot start it.

**Dead Resistance for Testing Bank.**—(1) A resistance for a testing bank devoid of inductance. (2) An inductionless resistance.

**Dead Wires.**—(1) Any disused wires or abandoned wires, generally aerial. (2) A term applied to that portion of the wire on a dynamo which produces no electromotive force on its movements through the field flux. (3) That part of the wire on a motor which produces no useful effect on the passage through it of a driving current.

**Dead Wires of Dynamo Armature.**—The wires on the armature of a dynamo or motor which produce no useful electromotive force or resulting current on the movement of the armature through the field of the machine.

**Dead Wires on Motor Armature.**—The wires on the armature of a motor which produce no useful torque on the passage through them of an electric current.

**Death, Electric.**—Death resulting from the passage of an electric discharge or current through the human body.

**Decalescence.**—An absorption of sensible heat that occurs at a certain time during the heating of a bar of steel.

**Decay of Waves.**—The diminution in the amplitude of waves due to obstruction of any kind.

**Deci.**—A prefix for the one-tenth part.

**Deci-Ampere.**—One-tenth of an ampere.

**Deci-Ampere Balance.**—A balance form of ammeter whose scale is graduated to give direct readings in deci-amperes.

**Deci-Lux.**—The one-tenth of a lux.

**Deci-Polar Dynamo.**—A dynamo whose field is produced by ten magnet poles.

**Decimal Candle.**—A photometric standard equal to the twentieth part of the Violle platinum standard.

**Deck Cable-Lead.**—Guide pulleys or leads, placed at suitable intervals on the deck of a cable ship, extending from a tank to the bow or stern sheaves, to aid in laying a submarine cable.

**Deck-Planer, Electric.**—An electrically driven rotary cutter or planer, suitable for planing the deck of a ship.

**Deflection of Magnet.**—The variation of a magnetic needle from the true geographical North.

**Deflection Compass.**—A declinometer.

**Declinometer.**—A magnetic needle suitably arranged for the measurement of the magnetic declination or variation of any place.

**Decohere.**—To restore or regain the natural condition of a coherer.

**Decomposition.**—The separation of a molecule into its constituent ions or radicals, or into its ultimate atoms.

**Decomposition, Electric.**—Chemical decomposition effected by means of an electric discharge or current.

**Decomposition, Electrolytic.**—The separation of a molecule into its constituent ions or radicals by the action of an electric current.

**Decorative Series Lamps.**—Series-connected incandescent lamps employed to obtain decorative effects.

**De-Energize.**—To deprive an electroreceptive device of its operating current.

**De-Energizing.**—Depriving an electroreceptive device of its operating current.

**Deep Sea-Cable.**—That portion of a submarine cable which is laid in the deep water, at a distance from the coast or shore.

**Deep-Seated Eddy-Currents.**—The eddy currents that are set up in the mass of a conductor subjected to electrodynamic induction, as distinguished

from the superficially-seated eddy-currents.

**Deep-Water Submarine-Cable.**—A deep sea cable.

**Defective-Loop Repeater.**—(1) A device for employing the good wire of a defective loop to an office, to receive and transmit alternately, on a duplex, or on the common side of a quadruplex set. (2) A repeater connecting a branch office with a duplex or quadruplex set at a main office, and arranged to operate on a single wire of a pair of loop toward branch office when the other wire becomes defective.

**Deflagration.**—A violent but not explosive combustion of a substance.

**Deflagration, Electric.**—The fusion and volatilization of metallic substances by the passage through them of an electric current.

**Deflagrator.**—The name given to a particular voltaic battery of small internal resistance employed, in the early history of the voltaic battery, for the electric deflagration of metallic substances.

**Deflecting Magnet.**—(1) The permanent magnet of a magnetometer, employed for deflecting a small magnetic needle suspended at a definite distance, in order to compare its influence with that of the earth's horizontal magnetic force. (2) The compensating magnet of a galvanometer.

**Deflection Method.**—A method employed in electrical measurements in which, as distinguished from the zero method, the amount of the deflection produced on any instrument, by a given current or a given charge, is utilized for determining the value of that current or charge.

**Deflection of Cable Dynamometer.**—(1) The sag, or distance to which a cable dynamometer sheave descends below the horizontal line corresponding to infinite tension. (2) The sag of a dynamometer sheave which increases as the strain on the cable diminishes.

**Deflection of Magnetic Needle.**—The movement of a needle out of a position of rest, either in the earth's magnetic field, or in the field of another magnet, by the action of the flux of an electric current or of a magnet.

**Deformation.**—(1) Any displacement of the particles of a solid with reference to one another, produced by the action of a stress. (2) A strain.

**Degeneration of Cell.**—Such a change in the muscular or cellular structure of a cell that incapacitates it from performing its ordinary functions.

**Degeneration of Energy.**—A degradation of energy.

**Deka.**—A prefix signifying ten times.

**Deka-Ampere.**—Ten amperes.

**Deka-Ampere Balance.**—A balance-form of ammeter measuring tens of amperes (0 to 100 amperes).

**Deliquescence.**—The solution of a crystalline solid arising from its absorption of the vapor of water from the atmosphere.

**Delivered Power.**—In a system of electrical transmission, the power that is delivered at one end of a line as it is gushed from the power sent into the line at its other end.

**Delta Connection.**—The connection of circuits employed in a delta triphase-system.

**Delta Current.**—(1) The current between adjacent wires or terminals of a triphase-system. (2) The ring current.

**Delta Potential of Triphase System.**—(1) The effective difference of potential or voltmeter pressure, between adjacent wires or terminals of a triphase-system. (2) The ring potential.

**Delta Triphase-System.**—A triphase system in which the terminal connections resemble the Greek letter delta, or triangle.

**Demagnetizable.**—Capable of being deprived of magnetism.

**Demagnetization.**—The act of depriving a magnet of its magnetism.

**Demagnetization by Successive Reversals.**—A process for removing the magnetism from a mass of steel, as in a watch, by subjecting it to many successive magnetomotive forces alternating in direction and gradually diminishing to zero.

**Demagnetize.**—To deprive of magnetism.

**Demagnetizing.**—Depriving of magnetism.

**Demagnetizing Current.**—The current which serves to remove the magnetization of some magnetic device.

**Demagnetizing Lines of Flux.**—Magnetic flux produced by a magnetized bar in a direction opposite to the magnetizing force, and tending, therefore, to demagnetize the bar.

**Demand Recording-Meter.**—A meter which registers the maximum demand for electric energy, usually a meter which registers the maximum current strength supplied through it, in addition to the total quantity of electricity delivered.

- Demarcation Current.**—A term sometimes applied to the electric current obtained from an injured muscle.
- Density, Electric.**—The quantity of free electricity on any unit of area of surface of a charged body.
- Density of Charge.**—The quantity of electricity per-unit-of-area at any part of a charged surface.
- Density of Current.**—The quantity of current that passes per-unit-of-area of cross-section in any part of a circuit.
- Density of Electrification.**—The density of an electrostatic charge.
- Density of Field.**—The quantity of magnetic flux that passes through any field per-unit-of-area of cross-section.
- Deutiphone.**—An audiphone.
- Dephased.**—(1) Differing in phase. (2) Caused to differ in phase.
- Depolarization.**—The act of reducing or removing the polarization of a voltaic cell or battery.
- Depolarize.**—To deprive of polarization.
- Depolarizer.**—The material employed in voltaic cells for the purpose of depolarizing them.
- Depolarizing.**—Depriving of polarization.
- Depolarizing Fluid or Liquid.**—An electrolytic fluid or liquid employed in a voltaic cell for the purpose of preventing or lessening polarization.
- Depositing Cell or Vat.**—Any electrolytic cell in which an electro-metallurgical deposit is made.
- Deposition, Electric.**—The deposit of a substance, generally a metal, by the action of electrolysis.
- Deprez-D'Arsonval Galvanometer.**—A form of dead-beat galvanometer.
- Derivation.**—(1) A shunt or derived circuit. (2) A leak.
- Derivative or Derived Current.**—The current that flows through a branch or derived circuit.
- Derived Circuit.**—(1) A branch or shunt circuit. (2) A derivation.
- Derived-Circuit Arc-Lamp.**—The name sometimes employed for a differential arc-lamp.
- Derived Units.**—Various secondary units obtained or derived from the fundamental units of length, mass, and time.
- Desk Loop.**—(1) In telegraphy, a loop or circuit, running to a desk in a telegraph office, and connecting the apparatus on such desk with main-line apparatus at some other table. (2) A circuit connecting an operator at one desk with a duplex or quadruplex set of apparatus at another desk for convenience in handling the traffic.
- Desk Push.**—An electric push attached to a desk for the purpose of ringing a call-bell, or closing some other electric circuit.
- Desk Set.**—Telephone apparatus arranged for use on a desk.
- Destructive Distillation.**—The action of heat on an organic substance while out of contact with air, resulting in the decomposition of the substance into simpler and more stable compounds.
- Detector Galvanometer.**—Any rough form of galvanometer or galvanoscope employed for detecting the presence of electric currents.
- Detector Peg.**—A peg used in connection with a detector galvanometer.
- Detonating Fuse.**—(1) A fuse that is exploded by a percussion or blow. (2) A percussion fuse.
- Detorsion Bar.**—A bar placed in a magnetic declinometer for the purpose of removing the torsion on the suspending thread of the magnet.
- Developed Winding.**—A winding of a dynamo electric machine developed or expanded upon a drawing or plane.
- Devil Claws.**—A device employed in stringing overhead wires.
- Dextrorsal Helix.**—A name sometimes applied to a dextrorsal solenoid.
- Dextrorsal Solenoid.**—A solenoid whose winding is right-handed.
- Diacritical Current.**—Such a strength of a magnetizing current as produces a magnetization of an iron core equal to one-half saturation.
- Diacritical Number.**—Such a number of ampere turns at which a given core would receive a magnetization equal to one-half saturation.
- Diacritical Point of Magnetic Saturation.**—A term proposed for such a value of the coefficient of magnetic saturation that its core is magnetized to exactly one-half of its possible maximum magnetization.
- Diagometer.**—An apparatus in which an attempt is made to determine the chemical composition, and consequent purity, of certain substances by their electrical conducting powers.
- Dial Bridge or Rheostat.**—A resistance bridge or rheostat whose contact points are arranged in the shape of a dial.



**Dial Telegraph.**—A general term embracing the apparatus employed in dial telegraphy.

**Dial Telegraphy.**—A system of telegraphy in which the messages are received by the movements of a needle over a dial plate.

**Dialysis.**—The act of separating a liquid mixture into its crystalloids and colloids by passing the liquid through a membrane.

**Dialyzing.**—Subjecting to the process of dialysis.

**Diamagnetic.**—The property possessed by substances like bismuth, phosphorus, antimony, zinc and others, of being apparently repelled when placed between the poles of powerful magnets.

**Diamagnetic Permeability.**—The permeability to magnetic flux possessed by diamagnetic substances.

**Diamagnetic Polarity.**—A polarity, the reverse of ordinary magnetic polarity, the existence of which was assumed to explain the phenomena of diamagnetism.

**Diamagnetically.**—In a diamagnetic manner.

**Diamagnetism.**—A name sometimes given to the magnetism of diamagnetic bodies.

**Diamagnetized.**—Subjected to the action of so-called diamagnetism.

**Diamagnetometer.**—A magnetometer designed for the study of diamagnetism.

**Diamagnets.**—Diamagnetic substances subjected to magnetic induction, and formerly called diamagnets in contradistinction to ordinary or paramagnets.

**Diameter of Commutation.**—(1) The diameter of the commutator cylinder of a dynamo at which the brushes are applied. (2) That diameter on the commutator cylinder of an open-circuited armature, which joins the points of contact of the collecting brushes.

**Diaphragm.**—(1) A sheet of an elastic solid, generally circular in shape, securely fastened at its edges and capable of being set into vibration. (2) The porous wall or septum of an endosmometer. (3) The porous partition of a voltaic cell. (4) A disc of blackened metal provided with a circular aperture and employed for cutting off all the light from a lens except that falling on its central portions.

**Diaphragm Currents.**—Electric currents produced by forcing a liquid through the capillary pores of a diaphragm.

**Diaphragm of Voltaic Cell.**—(1) The porous partition or plate of a voltaic cell. (2) Generally, a porous cell.

**Diaphragm Photometer.**—A photometer which depends on the equality of the brightness obtained on the two halves of a diaphragm or screen, either by varying the distances of the lights from the screen or by varying the inclination of the luminous rays thereon.

**Dice-Box Insulator.**—A name sometimes applied to a double-cone insulator.

**Dielectric.**—Any substance which permits electrostatic induction to take place through its mass.

**Dielectric Absorption.** The absorption of a charge or current by a dielectric.

**Dielectric Capacity.**—A term employed in the same sense as specific inductive capacity.

**Dielectric Circuit.**—A circuit formed in whole or in part through a dielectric as opposed to a conducting circuit.

**Dielectric Constant.**—A term sometimes employed in place of specific inductive capacity.

**Dielectric Current.**—(1) The rate-of-increase of the polarization of a dielectric produced by a change in the polarization through the circuit. (2) A displacement current.

**Dielectric Density of a Gas.**—A term sometimes employed instead of dielectric strength of a gas.

**Dielectric Displacement.** (1) Electric displacement taking place through a dielectric. (2) The electromotive intensity in a dielectric multiplied by  $\epsilon$  and divided by the dielectric co-efficient.

**Dielectric Elasticity.**—(1) The reciprocal of the dielectric co-efficient. (2) The measure of the electric force that must be exerted upon a dielectric in order to effect unit displacement.

**Dielectric Energy Current.**—That component of an alternating current passing through a condenser which is in phase with the impressed E. M. F. at its terminals.

**Dielectric Hysteresis.**—(1) A variety of molecular friction, analogous to magnetic hysteresis, produced in a dielectric under changes of electrostatic stress. (2) That property of a dielectric by virtue of which energy is consumed in reversals of electrification.

**Dielectric Hysteretic Admittance.**—(1) In an alternating-current circuit the apparent component of admittance due to dielectric hysteresis. (2) In a condenser traversed by an alternating current the admittance, which is the geometrical sum of the hysteretic conductance and the hy-



steretic susceptance, or whose reciprocal is the vector hysteretic impedance.

**Dielectric Hysteretic Impedance.**—In an alternating-current circuit, the apparent component of impedance due to dielectric hysteresis.

**Dielectric Hysteretic Lag.**—Lag in an alternating-current circuit due to dielectric hysteresis.

**Dielectric Medium.**—Any medium capable of acting as a dielectric.

**Dielectric Polarization.**—(1) The polarization of a dielectric by means of which electric induction takes place. (2) Dielectric displacement.

**Dielectric Resistance.**—(1) The resistance which a dielectric offers to mechanical strains produced by electrification. (2) The resistance of a dielectric to displacement currents.

**Dielectric Static Hysteresis.**—Hysteresis occurring in a dielectric under successive electric reversals, and due to a quasi-electrostatic friction independent of the rate of reversal, as distinguished from dielectric viscous hysteresis which varies with the frequency of cyclic electric reversals.

**Dielectric Strain.**—(1) The strained condition of the glass or other dielectric of a condenser produced by the charging of the condenser. (2) The deformation of a dielectric under the influence of an electromagnetic stress.

**Dielectric Strength of Gas.**—The electromotive intensity a gas is capable of bearing without permitting a disruptive discharge to pass through it, and capable of measurement in volts per centimetre.

**Dielectric Stress.**—(1) The electromagnetic force producing a deformation or strain in a dielectric. (2) Electromotive intensity.

**Dielectric.**—A name given to a variety of insulating material.

**Difference of Potential.**—That quantitative property in space by virtue of which work is done when a mass of any kind is moved from one point to another.

**Difference of Electric Potential.**—(1) That quantitative property in space whereby work is done when an electric charge is moved therein. (2) The electric work done on a unit charge in an excursion between two points.

**Difference of Magnetic Potential.**—(1) That quantitative property in space whereby work is done when a magnetic pole moves therein. (3) The magnetic

work done on a unit magnetic pole in an excursion between two points.

**Difference of Tension.**—A term sometimes incorrectly employed for difference of potential.

**Difference of Thermal Pressure.**—A phrase sometimes employed for the difference of temperature between any two points in a conducting substance that is assumed to cause the flow of heat through that conductor from the higher to the lower temperature.

**Difference Theory of Muscle and Nerve Currents.**—A theory proposed to explain the cause of the electric currents in living tissues, by an alteration or change in the protoplasm, by injury, by differences of temperature, or by polarization.

**Differential Coils.**—Coils that are differentially wound, or that act differentially.

**Differential Compound Motor.**—(1) A compound motor in which the magnetomotive force of the working current is opposed to the magnetomotive force of the shunt excitation, for the purpose of maintaining the speed constant under all loads. (2) A compound-wound continuous-current motor.

**Differential Electric Arc-Lamp.**—A term formerly employed for a derived-circuit arc-lamp, in which the lifting magnet either consists of a core or solenoid wound with series and shunt coils, or of two separate and opposed cores, one of which contains the series and the other the shunt winding.

**Differential Electric Bell.**—An electric bell whose magnetizing coils are differentially wound.

**Differential Electro-Dynamometer.**—(1) A double dynamometer with two moving coils rigidly connected and oppositely acted on, so that the movement of the suspension system can be reduced to zero by electrical adjustments made while the instrument is under operation. (2) A dynamometer for measuring the difference between two electro-dynamic forces.

**Differential Electro-Magnet.**—A differentially-wound electro-magnet.

**Differential Equation.**—An equation connecting quantities into which one or more differential coefficients or differentials enter.

**Differential Galvanometer.**—A galvanometer containing two coils, so wound as to tend to deflect its needle in opposite directions.

**Differential Induction Coil.**—(1) An induction coil employed in duplex and quadruplex telegraphy, having two differentially-wound primary coils, one of which is placed in the main line of the circuit, and the other in the circuit of an artificial line. (2) In telephony, an induction coil which sometimes forms part of the equipment of a multiple switchboard operator.

**Differential Inductometer.**—A galvanometric apparatus for measuring the momentary currents produced by the discharge of a cable.

**Differential Magnetometer.**—A magnetometer having a divided magnetic circuit and a needle differentially acted upon by the branches.

**Differential Method of Duplex Telegraphy.**—A system of duplex telegraphy in which the coils of the receiving and transmitting instruments are differentially wound.

**Differential Method of Quadruplex Telegraphy.**—A system of quadruplex telegraphy by means of a double-differential duplex system.

**Differential Permeability.**—The differential coefficient of flux density to magnetizing force in a substance undergoing magnetization.

**Differential Relay.**—A telegraphic relay containing two differentially wound coils of wire on its magnet core.

**Differential Speed.** In an induction machine, the angular velocity of the field relatively to the rotor.

**Differential Susceptibility.**—The differential coefficient of the magnetic intensity to the magnetizing force in a substance undergoing magnetization.

**Differential Thermo-Pile.**—A thermopile whose two opposite faces are exposed to the action of two nearly equal sources of heat, in order to determine accurately the difference in the thermal intensities of such sources of heat.

**Differential Voltmeter.**—A voltmeter consisting of two separate decomposition cells, one placed in a circuit of known resistance, and the other in a circuit whose resistance is to be determined.

**Differential Winding.**—Such a double winding of magnet coils that the two poles produced thereby are opposed to each other.

**Differential Winding of Field.**—(1) A field-magnet winding in which two exciting currents exert opposing magnetomotive forces. (2) A form of winding

in which the magnetizing flux of the series coil is opposed by the magnetizing flux of the shunt coils.

**Differentially-Wound Dynamo-Electric Machine.**—A compound-wound dynamo-electric machine.

**Differentially-Wound Motor.**—A compound-wound motor, in which the current in the shunt coils opposes, in its magnetizing effects, the current in the series coil so that the efficient magnetizing effect produced is the difference between the magnetizing effects of the two coils.

**Differentially Wound Translator.**—In telephony, a translator having one primary and two equal secondary coils employed in duplex working.

**Diffraction Grating.**—A plate containing a series of parallel linear openings, slits, or scratches, separated by opaque or semi-transparent spaces, employed for producing spectra by diffraction or interference.

**Diffusing Globes for Electric Lights.** Globes so constructed as to ensure diffusion of the light around which they are placed.

**Diffusion Creep.**—A term sometimes used for the diffusion of an electric current.

**Diffusion of Electric Current.** The flow of an electric current in the portions of a conducting substance that lie outside the parts in the direct line between the points where the terminals of an electric source are applied, so that a difference exists in the density of the current at different points of such substance.

**Diffusion of Electric Waves.** (1) The scattering of electric waves, or their deviation from a parallel beam. (2) The transmission of electric waves through a medium.

**Diffusion of Electro-Therapeutic Current.**—The differences in the density of current in different portions of the human body, lying between electro-therapeutic electrodes.

**Diffusion of Lines of Force.**—The diffusion of magnetic flux.

**Diffusion of Magnetic Flux.**—The lateral deflection of magnetic flux from the direct path between the poles that produce it.

**Digging Spoon.**—A spoon-shaped shovell used in digging holes for telegraph poles.

**Dilation, Electric.**—Electric expansion, or an increase in volume, produced in a body by an electric charge.

**Dilatometer.** An instrument resembling a thermometer, employed in measuring the expansion of a liquid by heat.

**Dimensions of Electro-Magnetic Units.**—The conventional exponential values of electro-magnetic units in terms of the fundamental units of length, mass, and time.

**Dimensions of Electrostatic Units.**—The exponential values given conventionally to the units of the electrostatic system, in terms of the fundamental units of length, mass, and time.

**Dimensions of Magnetic Units.**—The exponential values given conventionally to the units of the magnetic system, in terms of length, mass, and time.

**Dimensions of Units.**—The exponential values given conventionally to units in terms of length, mass, and time.

**Diminished Electric Irritability.**—A decrease in the irritability of nervous or muscular tissue produced by a suitable electric current.

**Dimmer.**—A choking coil employed in an alternating-current system of distribution for regulating the current strength passing through incandescent lamps.

**Diode Working.**—A term employed for the two-way mode of telegraphic working established by the Delany Synchronous Multiplex Telegraphic System.

**Dioptr.**—A unit of the refracting or focal power of a lens.

**Dioptr.**—An orthography commonly employed for dioptr.

**Dioptric.**—An orthography sometimes employed for dioptr.

**Dioptric.**—Of or pertaining to dioptrics.

**Dioptric Shade.**—A shade for a luminous source made of refractive material, which prevents the light from passing, in certain directions, by reason of its refractive power.

**Dioptrics.** The science which treats of the refraction of light.

**Dioptry.**—An orthography frequently employed for dioptr.

**Dip.**—The inclination of a magnetic needle.

**Dip Circle.**—A dipping needle provided with means for accurately measuring the angle of dip.

**Dip of Line-Wire or Conductor.**—The sag, due to its weight, of an aerial conductor between any two of its adjacent supports.

**Diphase - Alternating Currents.**—(1) Two separate alternating electric currents whose phase difference is a quarter of a cycle. (2) Two-phase currents. (3) Quarter-phase currents.

**Diphase-Alternating E. M. F.'s.**—(1) Two separate alternating-electromotive forces whose phase difference is a quarter of a cycle. (2) Two-phase E. M. F.'s. (3) Quarter-phase E. M. F.'s.

**Diphase Alternator.**—An alternator that produces diphase E. M. F.'s.

**Diphase Armature.**—The armature of a diphase alternator, or diphaser.

**Diphase Armature-Winding.**—Any armature winding capable of furnishing diphase currents.

**Diphase Circuit.**—A circuit, consisting either of three or four separate wires, employed for the transmission of diphase currents.

**Diphase Field.**—A diphase magnetic field.

**Diphase Generator.**—(1) A generator capable of producing diphase E. M. F.'s. (2) A diphase alternator.

**Diphase Inter-Connected Circuit.**—(1) A diphase circuit consisting of two outgoing conductors, one for each phase or side of the system, and a single return-conductor common to both. (2) A diphase system in which the two diphase circuits are not electrically separated or independent.

**Diphase Magnetic-Field.**—A magnetic field produced by diphase currents.

**Diphase Motor.**—A motor suitable for use with diphase electric currents.

**Diphase Rotary-Field.**—(1) A magnetic field produced by four or more magnet poles whose coils are so wound that their polarity not only alternates with changes in the direction of the current, but acts as though the field rotated. (2) A rotating magnetic field produced by diphase currents.

**Diphase Transformer.**—A polyphase transformer suitable for use with diphase currents.

**Diphase-Triphase Transformer.**—A transformer for converting diphase into triphase currents.

**Diphaser.**—A word sometimes used for diphase alternator.

**Diplex Circuit.** The circuit, including the line wire and apparatus, employed in any diplex system.

**Diplex Telegraph.**—A general term embracing the apparatus employed in diplex telegraphy.

**Diplex Telegraphy.**—Any method by which two telegraphic messages can be simultaneously sent in the same direction over a single wire.



**Diplex Telephony.**—Any method by which two telephone messages can be simultaneously sent in the same direction over the same wire.

**Diplex Transmission.**—The simultaneous telegraphic or telephonic transmission of two messages in the same direction over a single wire.

**Dipolar.**—(1) Possessing two poles. (2) Bipolar.

**Dipping.**—(1) An electro-metallurgical process whereby a thin coating or deposit of metal is obtained on the surface of another metal by dipping it in a solution of a readily decomposable metallic salt. (2) Cleansing surfaces for electro-plating, by immersing them in various acid liquors.

**Dipping Basket.**—A perforated basket of non-corrosive material, employed in electro-plating, for the reception of articles that are to be cleansed by dipping.

**Dipping Hook.**—A metallic hook employed in electro-plating for holding articles that are to be cleansed by dipping.

**Dipping Magnetic Needle.**—(1) A magnetic needle suspended so as to be free to move in a vertical plane only, and employed to determine the angle of dip or magnetic inclination. (2) An inclination compass.

**Dipping Needle.**—A term sometimes used for a dipping magnetic needle.

**Dipping Wire.** The wire employed in electro-metallurgy for suspending small articles that are to be cleansed by dipping.

**Dips.**—Acid liquors employed in dipping.

**Direct-Coupled Dynamo.**—A dynamo whose armature shaft is directly coupled to the driving shaft.

**Direct Coupling.**—Coupling the shaft of a dynamo armature directly to the driving or engine shaft.

**Direct-Current.**—(1) A current whose direction is constant, as distinguished from an alternating current. (2) A continuous current.

**Direct-Current Dynamo-Electric Machine.**—Any dynamo-electric machine capable of furnishing direct currents.

**Direct-Current Electric Motor.**—An electric motor driven by means of direct or continuous currents, as distinguished from a motor driven by alternating currents.

**Direct-Current Rotary Transformer.**—(1) A term sometimes employed for a ro-

tating secondary generator of continuous currents. (2) A motor-dynamo or dynamotor.

**Direct-Current Transformer.**—(1) A transformer intended to vary the strength of continuous currents. (2) A direct-current secondary-generator.

**Direct-Driven Dynamo or Generator.** A direct coupled dynamo or generator.

**Direct-Deflection Method of Measuring Resistance.**—A method of measuring resistance based on the deflection of a galvanometer in circuit with a resistance and a battery.

**Direct-Electromotive Force.**—(1) An electromotive force acting on a circuit in the same direction as another electromotive force already existing in that circuit. (2) The electromotive force acting on any circuit in contra-distinction to the counter-electromotive force set up in such circuit. (3) A continuous-electromotive force as distinguished from an alternating-electromotive force.

**Direct Excitation.**—(1) The excitation of a muscle, resulting from the placing of an electrode directly on the muscle itself. (2) The excitation of a dynamo electric machine by a separate source of direct currents, as distinguished from its excitation by commutated currents taken from its own armature.

**Direct-Induced Current.**—The break induced current.

**Direct Inker.**—An ink-writing Morse recorder, wound for insertion in a telegraphic line, as distinguished from one wound for a local circuit.

**Direct Lightning-Discharge.**—The actual lightning discharge, as distinguished from the back or return-stroke or discharge.

**Direct-Reading Galvanometer.**—A galvanometer in which the absolute value of the deflection and current strength are indicated directly, or without computation.

**Direct Sounder.**—A telegraphic sounder wound for a line circuit and not for use in the local circuit of a relay.

**Direct-Reading Potentiometer.**—A potentiometer which indicates directly on its scale the pressure measured at its terminals.

**Direct Working of Telegraphic Sounder.**—The working of a telegraphic sounder without the use of a telegraphic relay.

**Directed Streaming Discharge.**—A Tesla or high-frequency discharge which



assumes the shape of a highly luminous cone.

**Directing Clock.**—A controlling or master clock.

**Directing Magnet.**—A controlling or compensating magnet.

**Direction of Electric Current.**—A convention whereby an electric current is regarded as leaving a source at its positive pole, and re-entering it at its negative pole.

**Direction of Electrostatic Flux.**—A convention whereby it is assumed that electrostatic flux leaves a positively charged body at its positive pole, and terminates on a negatively charged body.

**Direction of Lines of Force.**—The direction of magnetic or electrostatic flux.

**Direction of Magnetic Flux.**—A convention whereby it is assumed that magnetic flux issues from a magnet at its north-seeking pole, and returns to it at its south-seeking pole.

**Direction of Negative Rotation.**—In the conventionally adopted system of kinetics, a clock-wise rotation about an axis as viewed from the front side of the clock.

**Direction of Positive Rotation.**—In the conventionally adopted system of kinetics the counter-clockwise direction of rotation about an axis as viewed from the front face of the clock.

**Directive Tendency of Magnetic Needle.**—The tendency of a magnetic needle to come to rest in the direction of the earth's magnetic flux.

**Disc Armature.**—(1) The armature of a dynamo-electric machine whose windings consist of flat coils supported on the surface of a disc. (2) An armature having the form of a disc.

**Disc Electrodes.**—Disc-shaped carbon electrodes formerly employed in long-burning or all-night arc-lamps.

**Discharge.**—(1) The equalization of the difference of potential between the terminals of a condenser or source, on their connection by a conductor. (2) The removal of a charge from a conductor by connecting the conductor to the earth or to another conductor. (3) The removal of a charge from an insulated conductor by means of a stream of electrified air particles.

**Discharge.**—To equalize differences of potential by connecting them by a conductor.

**Discharge Key.**—A key employed to pass the discharge from a condenser or cable through a galvanometer.

**Discharge of Magnetism of Field Magnets.**—A term sometimes employed for the unbuilding of a dynamo, or its gradual failure to produce current on the loss of magnetism of its field magnets.

**Discharging Rate.**—The strength of the discharging current of a storage cell or battery.

**Discharge Resistance.**—The resistance that is placed in the path or circuit of a discharge.

**Discharging Rod.**—A jointed metallic rod, blunted at both ends, capable of adjustment as to the distance of the ends from each other, and provided with insulating handles, employed for the disruptive discharge of Leyden batteries or condensers.

**Discharging Tongs.**—A pair of discharging rods with an insulating handle, connected together by a rivet like a pair of tongs, for effecting the disruptive discharge of a Leyden jar or condenser.

**Discoidal Ring-Armature.**—A term sometimes used for disc armature.

**Discoidal Winding.**—The flat-ring winding employed in a disc armature.

**Disconnect.**—(1) To break or open an electric circuit. (2) To remove an electro-receptive device from a circuit.

**Disconnecting.**—The act of opening or breaking a circuit, or of removing electro-receptive devices therefrom.

**Disconnecting Plug.**—An infinity plug.

**Disconnection.**—(1) A general term designating a variety of faults caused by the accidental breaking or disconnection of a circuit. (2) The intentional opening or breaking of a circuit, or the removal of an electro-receptive device therefrom. (3) A discontinuity in a circuit.

**Disconnecter.**—A key or other device for opening or breaking an electric circuit, or for removing an electro-receptive device therefrom.

**Discontinuity Plug.**—A name sometimes employed for an infinity plug.

**Discriminating Lightning-Arrester.**—The name sometimes applied to a non-arcing continuous-current lightning-arrester.

**Dielectrification.**—A general term employed for the act of causing a charged body to lose its electric charge.

**Disguised Electricity.**—Dissimulated or latent electricity.

**Disintegration of Storage Battery Plate.**—The gradual loosening or separation of the active material of a storage battery plate from the perforations of the grid.

**Disjunctor.**—A device employed in a system for the distribution of electric energy by means of continuous currents in connection with condensers, for periodically reversing the constant current sent over the line.

**Dispersing Pad-Electrode.**—A therapeutic pad-electrode, suitable for use with strong currents, applied directly to the body, for diffusing the therapeutic current through a large tract thereof.

**Dispersion Photometer.**—A photometer in which the light to be measured is decreased in intensity by a known amount, so as to be more readily compared with a standard light of much smaller intensity.

**Displacement Current.**—(1) The rate-of-change of electric displacement. (2) An electric current produced in a dielectric by electric displacement, as opposed to a conduction current.

**Displacement, Electric.**—A displacement of electricity in a uniform non-crystalline dielectric when electrostatic flux passes through it.

**Displacement Flux.**—(1) The flux of electric displacement. (2) The surface integral of displacement effected through the surface.

**Displacement Lines.**—The lines along which displacement flux moves.

**Displacement Waves.**—Waves produced in the ether by means of electric displacements.

**Disruptive Discharge.**—A sudden and more or less complete discharge that takes place across an intervening non-conductor or dielectric.

**Disruptive Electric-Conduction.** The conduction of electric energy which accompanies a disruptive discharge.

**Disruptive Strength of Dielectric.**—The strain a dielectric is capable of bearing without suffering disruption, or without permitting a disruptive discharge to pass through it.

**Dissipation Function.**—(1) A function expressing the rate at which heat is produced by the passage of an electric current through a conductor. (2) A function, which, when differentiated with respect to a velocity as the independent variable, gives the applied force required to overcome the dissipative resistance to motion.

**Dissipation of Charge.**—The gradual but final loss of charge by leakage, which occurs even in a well insulated condenser.

**Dissipation of Energy.**—The expenditure or loss of available energy.

**Dissipativity.**—The time-rate of dissipation of energy as heat per-unit-volume of substance.

**Dissimulated Electricity.**—(1) A charge sometimes applied to the condition of electric charge when placed near a positive charge, as in a Leyden jar or condenser. (2) A bound charge.

**Dissociate.**—To separate a compound substance into its constituent parts.

**Dissociation.**—The separation of a compound substance into its constituent parts.

**Dissonance, Electric.**—(1) Electric disagreement. (2) A term employed in contradistinction to electric consonance, alternating electromotive forces, or currents, whose phases are in opposition.

**Dissymmetrical Alternating-Electromotive Forces.**—Alternating electromotive forces, in which an alternating semi-wave, when reversed in sign, does not reduplicate the preceding or succeeding semi-wave.

**Dissymmetrical Induction of Armature.**—Any induction produced in the armature of a dynamo that is unequal in amount, in opposite or symmetrically opposed portions of the armature.

**Dissymmetrical Magnetic Field.**—A field whose flux is not symmetrically distributed.

**Dissymmetry of Commutation.**—A commutation in which the neutral axis does not coincide with the diameter of commutation.

**Distant Battery.**—A battery employed in any telegraphic system at the transmitting end of the line.

**Distant Station.**—A term applied to a telegraph operator to the distant end of the line, in order to distinguish it from his own, or the home end.

**Distillation, Electric.**—The distillation of a liquid in which the effects of electric force are aided by the electrification of the liquid.

**Distorsion.**—The change in the shape or configuration of a medium, or a quantity, produced by the action of a stress or disturbance.

**Distorsion of Magnetic Field.**—A change in the direction or distribution of the magnetic flux in the field of a dynamo.

armature, produced by the magnetomotive force of the armature current.

**Distorsional Elasticity.**—Elasticity in a body, due to its distorsion or deformation.

**Distorsionless Cable.**—A cable that forms part of a distorsionless circuit.

**Distorsionless Circuit.**—(1) A telegraphic circuit in which leakage and conductor resistance are so balanced as to leave no tailings. (2) A telegraphic circuit in which there is no distorsion of signals or electric waves.

**Distributed Capacity.**—The capacity of a circuit considered as distributed over its entire length, so that the circuit may be considered as shunted by an infinite number of infinitely small condensers, placed infinitely near together, as distinguished from localized capacity, in which the capacity is distributed in discrete aggregations.

**Distributed Inductance.**—Inductance distributed throughout the entire length of a circuit or portion thereof, as distinguished from inductance interposed in a circuit in bulk at some one or more points.

**Distributed Winding of Dynamo Electric Armature.**—A winding disposed regularly over the surface of the armature as distinguished from a pole-winding, or a winding composed of a few localized coils.

**Distributing Board.**—(1) A term sometimes employed in a system of telephonic or telegraphic communication, to a cross-connecting board. (2) A board at which the wires or cables from a telephone switchboard terminate and at which connections are made with the circuit wires. (3) An insulating board provided with screw connecting-pieces for readily connecting branch circuits to mains in a distributing system, with or without fuse cut-outs.

**Distributing Box.**—(1) A box containing means for readily changing the connections of distribution circuits with their source of supply. (2) A device by means of which both arc and incandescent lights may be simultaneously employed on the same constant-current circuit. (3) A device for cutting into or out of an arc circuit, at will, a group of series incandescent lamps.

**Distributing Box of Conduit.**—A name sometimes given to a man-hole of a conduit.

**Distributing Brushes of Motor.**—The brushes which rest on the commutator of an electric motor and carry the driving current to it.

**Distributing Mains.**—The mains employed in a feeder system of parallel distribution.

**Distributing Point.**—A point, usually at the junction of risers and mains, or mains and sub-mains, where all the fuses or safety catches, belonging to that part of the system, are collected.

**Distributing Station.**—(1) A station from which electricity is distributed. (2) A central station.

**Distributing Switch.**—A switch for closing a plurality of distributing circuits at will upon the source of supply.

**Distributing Switchboard.**—(1) A multiple switchboard. (2) A device for distributing electricity over any of a number of circuits.

**Distributing Box.**—A box placed at a distributing point for holding all the fuses belonging to that portion of the distributing system.

**Distributing Box for Arc-Light Circuits.**—A device by means of which both arc and incandescent lights may be simultaneously employed on the same line from a constant-current dynamo-electric machine.

**Distributing Centre.**—(1) In an electrical distribution system a centre or sub-centre of distribution. (2) A ramifying point.

**Distribution of Charge.**—The diffusion or dispersion of an electric charge over the surfaces of electrified bodies.

**Distribution of Electricity.**—The division and transmission of electric energy by means of various combinations of electric sources, circuits and electro-receptive devices, so arranged that the electricity generated by the sources is carried or distributed to more or less distant electro-receptive devices, by means of the various circuits connected therewith.

**Distribution of Electricity by Alternating Currents.**—A system of electric distribution in which the lamps, motors or other receptive devices, are operated by means of alternating currents that are sent over the line or lines, in many cases after they have been modified by apparatus called transformers.

**Distribution of Electricity by Alternating Currents by Means of Condensers.**—A system of alternating-current distribution in which condensers are employed to transform currents of high potential, received from an alternating-current dynamo, to currents of low potential which are fed to the lamps or other electro-receptive devices.



**Distribution of Electricity by Commutating Transformers.**—A system of electric distribution in which motor generators are used, but neither their field-magnets nor armatures are revolved, a special commutator being employed to change the polarity of the magnetic circuits.

**Distribution of Electricity by Constant-Currents.**—Any system of electric distribution employing direct currents, as distinguished from one employing alternating currents.

**Distribution of Electricity by Constant Potential-Circuits.**—A system of electric distribution in which the receptive devices are placed in multiple or multiple-series across constant-potential mains.

**Distribution of Electricity by Continuous Currents by Means of Condensers.**—A system of distribution in which a continuous current is conducted to certain points in a line, where a disjuncter is employed to reverse it periodically, the reversed currents so obtained being directly used to charge condensers in the circuit of which induction coils are employed.

**Distribution of Electricity by Continuous Currents by Means of Transformers.**—A system for the transmission of electric energy by means of continuous or direct currents that are sent over the line to suitably located stations where motor-dynamos are used for transformers.

**Distribution of Electricity by Motor-Generators.**—A system of electric distribution in which a continuous high-potential current, distributed over the main line, is employed at the point where its energy is to be utilized for driving a motor, which in turn drives a dynamo whose current is employed to energize the electro-receptive devices.

**Distribution of Power, Electric.**—Any system in which mechanical energy is first converted into electro-magnetic energy and then distributed over a line wire or circuit to electric motors, which again change the electro-magnetic energy into mechanical energy.

**Distributor.** A word sometimes applied to the distributing mains in a parallel system of distribution.

**District Call-Box.**—A box by means of which an electric signal is automatically sent over a telegraph line and received by an electromagnetic device at the other end of the line.

**Diurnal Currents.**—Earth through telegraph circuits strength and executing diurnal

**Diurnal Inequality of Earthnotism.**—Diurnal variations of the earth's magnetic variation.

**Diurnal Load-Factor.**—(1) Between the total number of hours from a station in twenty-four the amount which would have been out in the same time if the working at its maximum for whole twenty-four hours. (2) Daily average to daily maximum.

**Diurnal Variation.**—An irregular variation of the magnetic which occurs at different days.

**Divalent.**—(1) Possessing an valency of two. (2) Bivalent

**Divergence.**—(1) The integrally directed flux over the surface of volume divided by (2) The opposite of convergence.

**Divergent Flux.**—(1) Flux that or diffuses as it proceeds. (2) decreases in intensity along

**Divergent Vector Quantity.** point function in space having

**Diverging-Lens Photometer.** tometer in which the intensity of light to be measured is measured by means of a diverging lens.

**Diverging Magnetic Flux.** flux that decreases in intensity as it diverges or diffuses in direct path.

**Diversity Factor.**—A term denoting the ratio of the average supplied power to a consumer to the power supplied.

**Diviance.** A term proposed to denote the flow of magnetic induction.

**Divided Circuit.**—(1) A branched circuit. (2) A term employed for multiple circuit.

**Divided Core.**—A laminated

**Divided Magnetic Circuit.** netic circuit which bifurcates

**Divided Telephone-Switch.** multiple telephone switchboard

**Divided Touch.**—A term of magnetization by separate

**Divided Trolley Line.**—A line used for a sectional trolley

**Dividing Engine.**—(1) A machine for dividing a thermometer



metric, or other scale, into equal parts. (2) A device for dividing a tube or a scale into equal parts of a length, consisting essentially of a horizontal screw by means of which a carriage carrying suitable marking gear can be moved along a parallel prismatic guide.

**Division Operator.**—A railway telegraph operator in charge of a telegraph division or section of railway telegraph.

**Doctor for Plating.**—A device employed in electro-plating for coating surfaces that are too extended to be immersed at once in the plating bath.

**Dolly.**—A polishing brush employed in electro-plating, consisting of a number of calico rings suitably clamped together in a wooden holder for attachment to a lathe.

**Domestic Telephone-Switchboard.**—(1) A telephone switchboard located in a house for readily connecting different rooms. (2) A local telephone switchboard for connecting apartments in a residence.

**Door-Bell Pull, Electric.**—A circuit-closing device attached to a bell-pull and operated by the ordinary motion of the pull.

**Door-Contact Lamp.**—A contact which lights a lamp and permits it to remain lighted only while the door operating its circuit remains in a certain position.

**Door-Opener, Electric.**—An electromagnetic device for opening a door from a distance.

**Door Push.**—A contact closed or opened by the opening or shutting of a door to give a notice of the movement at a distance, as in a burglar-alarm system.

**Door Trigger.**—A device by means of which notice is given of the opening or closing of a door or window.

**Dot-and-Dash Code.**—A term sometimes employed for the Morse telegraphic code.

**Dotting Contact.**—An electric contact obtained by the approach of one contact point towards another.

**Double Alternation.**—(1) A complete cycle or double vibration. (2) A complete to-and-fro movement.

**Double Armature Windings.**—Two separate armature windings applied symmetrically to a core, and whose ends are connected respectively to alternate commutator bars.

**Double-Balance Relay.**—In a closed-current system of alarm telegraphy, a pair of relays connected in series, one of which will close a local circuit if the main line current appreciably weakens, and the

other of which will close a local circuit if the main line current appreciably strengthens.

**Double-Bar Switch.**—A switch or reverser consisting of a pair of parallel metallic bars or strips which move together upon independent centres so as to make contact simultaneously upon one or more pairs of contacts.

**Double-Block Duplex System.**—A system of duplex telegraphy in which a condenser exists in both arms of the duplex bridge.

**Double-Break Knife-Switch.**—(1) A knife switch which breaks a circuit at two points. (2) A knife switch provided with a contact for both poles.

**Double-Break Switch.**—A term sometimes used for double-pole switch.

**Double-Bracket Pole.**—A pole employed in an overhead line for the support of a double bracket.

**Double-Bracket Trolley Suspension.**—In a double-track trolley road, a pole provided with two brackets, one extending over each track, and provided for holding the two trolley wires.

**Double-Block Duplex System.**—A duplex system on the Wheatstone bridge system, employing a condenser in each arm of the bridge.

**Double-Break Switch.**—(1) A double-pole switch. (2) A switch which breaks a circuit in two places, as distinguished from a switch which breaks a circuit at a single point only.

**Double-Bronze Wire.**—A conducting wire possessing great tensile strength, provided with an aluminium-bronze core, and a copper-brass envelope.

**Double-Carbon Arc-Lamp.**—An arc-lamp which will burn all night without re-carboning, containing two sets of carbon electrodes so arranged that, when one set is practically consumed, the current is automatically switched to the other set.

**Double-Circuit Dynamo.**—A dynamo-electric machine provided with two separate circuits.

**Double-Conductor Cable or Wire.**—A cable or wire provided with two separate insulated conductors.

**Double-Cone Insulator.**—An insulator in which the line wire passes through and is supported by means of a tube consisting of two inverted, truncated cones, joined at their vertices.

**Double-Connector.**—A form of binding screw suitable for readily connecting two wires together.

**Double-Contact Key.**—A key suitable either for making two separate successive contacts, or for closing either of two circuits.

**Double-Contact Push.**—A push provided with two contacts so arranged that the pressure of a push opens one contact and closes the other.

**Double-Contact Push Button.**—A push-button provided with two contacts.

**Double-Cord Multiple-Switchboard.**—A multiple telephone switchboard in which connections are made by plugs and cords having two twin wires, as opposed to a switchboard in which single cord plugs are used.

**Double-Cord Switchboard.**—(1) A switchboard employing twin-wire or double-conductor connections. (2) A switchboard in which each connection is established through a pair of cords, as distinguished from a single-cord switchboard.

**Double-Cup Insulator.**—(1) An insulator consisting of two funnel-shaped cups, placed in an inverted position on the supporting pin, and separated from each other by a free air-space except at the ends which are connected. (2) A double-petticoat insulator.

**Double-Curb.**—A device for increasing the speed of telegraphic signalling by ridding the line of its charge before the next signal is sent, by sending more than one reversal of current with or without grounding the line, as distinguished from a single-curb.

**Double-Curb Signalling.**—Signalling by means of a double curb.

**Double-Current Signalling.**—(1) Signalling by means of currents that alternately change their direction. (2) Signalling in which the marking currents have one direction and the spacing currents the opposite direction.

**Double-Current Telegraphic Working.**—Telegraphing or operating by means of double currents.

**Double-Current Translation.**—(1) The automatic repetition of a telegraphic message by means of double currents. (2) Telegraphic translation employing double currents.

**Double-Current Translator.**—A telegraphic translator or repeater designed to operate on double-current transmission.

**Double-Current Transmitter.**—A transmitting instrument employed in a system of telegraphy in which the direction of the line current is alternately changed,

according to whether the key rests on its front or on its back stop.

**Double-Current Working.**—A method of telegraphic working or transmission by means of double currents.

**Double-Curve Pull-Off.**—A double-curve hanger.

**Double-Curve Trolley Hanger.**—A hanger provided for holding an overhead trolley wire, supported by a lateral strain in opposite directions, and employed, generally at the end of both single and double curves, and on intermediate points on double-track curves.

**Double-Curve Trolley-Suspension.**—Suspension by means of a double-curve trolley hanger.

**Double-Deck Switchboard.**—A switchboard arranged in two rows placed one above the other.

**Double-Dielectric Refraction.**—Double electric refraction produced in a dielectric by the action of an electro-magnetic stress.

**Double-Duplex Block.**—In submarine telegraphy, duplex transmission obtained by the aid of a condenser inserted in each arm of a Wheatstone's balance.

**Double-Filament Lamp.**—(1) An incandescent lamp, frequently employed for the side-light of a ship, and provided with two carbon filaments so arranged that should one break, the other will continue burning. (2) A twin-filament lamp. (3) An incandescent lamp having two filaments connected in series, and, therefore, requiring twice the electric pressure of an ordinary lamp.

**Double-Flexible Conductor.**—A conductor consisting of two separate stranded flexible conductors, provided with an insulating covering common to both.

**Double-Fluid Electrical Hypothesis.**—A hypothesis which endeavors to explain the causes of electrical phenomena by the assumption of the existence of two different electric fluids.

**Double-Fluid Voltaic Cell.**—(1) A voltaic cell in which two separate fluids or electrolytes are employed. (2) A two fluid voltaic cell.

**Double-Focus X-Ray Tube.**—An X-ray tube, suitable for use with alternating electric currents, in which two anode-cathodes are employed, so arranged that they act as a common source of X-rays.

**Double-Hatchet Switch.**—A term sometimes used for a double-knife switch.

**Double-Horseshoe Field-Magnet.**—A multiple field magnet of a dynamo formed by two separate electro-magnets.

**Double Insulation.**—Insulation of a conductor effected at two distinct points, so that if one insulation should fail the other will serve.

**Double-Key Tapper.**—A key used in a system of needle telegraphy to send electric impulses through the line in alternately opposite directions.

**Double-Liquid Voltaic Cell.**—A double-fluid voltaic cell.

**Double-Loop.**—(1) In telegraphy, any pair of associated loops. (2) A pair of loops connecting a pair of branch offices with a central office.

**Double-Loop Repeater.**—In telegraphy, a pair of loops connecting a pair of branch offices with a central office, and so connected with a duplex set, or with the common side of a quadruplex set, in the main office, that one branch office can send messages on the duplexed line while the other office is receiving.

**Double-Magnet Dynamo-Electric Machine.**—A term sometimes applied to a dynamo-electric machine, whose field magnets have two consequent poles.

**Double-Needle Telegraphy.**—A system of needle telegraphy in which two separate and independently operated needles are employed on two separate circuits.

**Double-Peg.**—A split peg which closes two separate contacts, when inserted in the switchboard to which it belongs.

**Double-Pen Telegraphic-Register.**—A telegraphic register provided with two separate styluses or pens for recording the message on a paper fillet.

**Double-Petticoat Insulator.**—(1) A double insulator, placed one within and beneath the other, to reduce the electric leakage over the surface. (2) A double-cup insulator.

**Double-Plug.**—A double peg.

**Double-Plug Key.**—A plug key made in two separate parts that are insulated from each other.

**Double-Pole Bell.**—An electro-magnetic bell having a polarized armature which plays between a pair of electro-magnetic poles.

**Double Pole.**—(1) A double telegraph pole. (2) Two telegraph poles placed side-by-side and braced together. (3) An H-pole.

**Double-Pole Cut-Out.**—(1) A cut-out which provides in a single operation the

cutting out of both the positive and the negative leads. (2) Two safety fuses, mounted on the same holder, and connected respectively to the positive and negative mains.

**Double-Pole Fusible Cut-Out.**—A term sometimes used for double-pole cut-out.

**Double-Pole Safety-Fuse.**—An automatic double-pole cut-out.

**Double-Pole Switch.**—A switch which simultaneously breaks the circuit of both positive and negative leads.

**Double-Pole Telephone-Receiver.**—A telephone receiver in which both poles of a small electro-magnet are presented to the diaphragm.

**Double Pull-Off.**—(1) A pull-off employed on curves to hold a trolley wire in position when strain in both directions is necessary to hold it in place. (2) A double-curve pull-off.

**Double-Reduction.**—A gear wheel velocity reducer employing two gear wheels and two pinions, or one intermediate shaft.

**Double-Reduction Car-Motor.**—A car-motor provided with a double-reduction, or with one intermediate gear shaft between the motor shaft and car wheel.

**Double-Reflection Tube.**—A term sometimes employed for a double-focus X-ray tube.

**Double-Refraction.**—The property possessed by certain transparent substances of splitting up a ray of light passed through them into two separate rays.

**Double-Refraction, Electric.**—The property of doubly refracting light acquired by some transparent substances when subjected to the stress of an electrostatic or electro-magnetic field.

**Double Ringing-Key.**—In a multiple telephone switchboard, a pair of keys forming part of an exchange operator's set, employed in ringing up.

**Double-Shackle Insulator.**—A form of insulator employed in shackling a wire, consisting of two single-shackle insulators.

**Double-Shed Insulator.**—A double-cup insulator.

**Double-Speaking Telegraph.**—A term sometimes employed for the duplex telegraph as employed on submarine cables.

**Double-Style Printing Apparatus.**—A double Morse receiver employing two printing levers or styluses marking dots in parallel lines, one responding to positive currents and representing dots, and the other responding to negative currents and representing dashes.



**Double-Successive Contact-Key.**—A key so arranged as to successively close two separate circuits.

**Double Tappor Key.**—A key employed in a system of needle telegraphy to send electric impulses over the line in alternately opposite directions.

**Double Telegraphic Transmission.**—Any method of simultaneously sending two messages over a single line wire or conductor.

**Double Telegraphy.**—A term sometimes employed for duplex telegraphic working.

**Double-Throw Switch.**—(1) A switch capable of being thrown into either of two contacts or pairs of contacts. (2) A switch which has three positions. (3) A throw-over switch.

**Double-Touch.**—Magnetization by double touch.

**Double-Transmission.**—(1) The simultaneous sending of two messages over a single wire in opposite directions. (2) Duplex or contraplex telegraphy.

**Double-Transmitter for Engine Telegraph.**—A transmitter on board a twin-engine steamer for communicating orders electrically to the engine-room for both engines simultaneously.

**Double-Trolley.**—Two separate trolleys placed on the same car, and moving over two separate trolley wires which form a metallic circuit, in any double-overhead system.

**Double-Trolley Line.**—A metallic-circuit trolley line employing two trolleys, one connected with the positive conductor and the other with the negative conductor.

**Double-Trolley System for Electric Railroads.**—An electric trolley system employing double trolley wires and double trolleys so as to provide a complete metallic circuit.

**Double-Truck Car.**—A car supported on two separate single trucks, and employed with long cars for safety and ease in turning around sharp curves.

**Double Vibration.**—(1) A to-and-fro or complete vibration. (2) A complete cycle of vibratory motion.

**Double Winding of Armature.**—An armature winding provided with two separate wire-circuit windings, in which the separate windings are insulated from each other and connected to the commutator at alternate segments, so that the brushes rest alternately upon segments that are connected with each winding, thus permitting each winding to furnish half the current strength with an attend-

ant decrease in the inductance of each circuit.

**Double-Wire Circuit.**—A metallic circuit.

**Double-Wire Cleat.**—A cleat for supporting a pair of wires.

**Double-Wire Moulding.**—A moulding for containing two wires, each in a separate groove.

**Double-Wire System for Electric Light Loads.**—On board ship, a system of electric-light wiring in which going and returning conductors are provided, as distinguished from a single-wire system in which the hull of the vessel is employed as a common return.

**Double-Wire Telephono-Switchboard.**—A switchboard in a central telephonic exchange, employing metallic circuits, in which each subscriber is connected to an independent double wire or metallic circuit.

**Double-Word.**—In telegraphy, a word of more than the prescribed length and therefore, counted and charged as two.

**Double-Wound Gramme Ring.**—A gramme ring provided with two independent and symmetrically interspersed windings.

**Double-Wound Wire.**—Wire provided with a double winding of cotton, silk or other insulating thread.

**Doubler of Electricity.**—An early form of continuous electrophorus.

**Doubly Re-Entrant Armature-Winding.**—(1) A winding in which the armature is provided with two separate windings or conducting paths, each of which is independently re-entrant. (2) A doubly-wound armature, each winding of which is re-entrant.

**Doubly-Wound Resistance Coils.**—A resistance coil wound, as is usual, with the wire doubled on itself, in order to minimize self-induction.

**Douche, Electric.**—An electrified shower-bath.

**Down-Contact of Switch.**—A contact which is made by the downward movement of a switch.

**Down-Lines.**—In the United Kingdom of Great Britain and Ireland, telegraphic lines on the side remote from the principal station of the circuit, as distinguished from up-lines.

**Down-Side.**—In Great Britain that side of a telegraphic circuit, further from the metropolitan or principal town of the circuit, as distinguished from the up-side.



**Drag.**—In submarine cable operations, a haul made with a grapnel across a line of cable in the hope of hooking said cable.

**Drag of Magnetic Field.**—A word sometimes employed for the torque or electrodynamic force produced by a magnetic field on an active conductor placed in it.

**Draw-Bar.**—In a locomotive, the link or bar which connects it with its load.

**Draw-Bar Pull.**—The pull delivered by a locomotive at its draw-bar, as distinguished from the pull exerted by its motor.

**Drawbridge Frog.**—A trolley frog for use at the point of overhead contact with a drawbridge wire.

**Draw Tongs.**—A species of vise employed in connection with a light block-and-tackle for obtaining the required tension on an aerial line wire.

**Draw Vise.**—(1) A device employed in stringing overhead wires. (2) A portable vise for holding and drawing up an overhead wire.

**Drawing-In-and-Out Conduit.**—A conduit provided with ducts, so as to readily permit the wires or conductors to be placed in the conduit or removed from after they have been placed therein.

**Drawing-In Box.**—A flush box.

**Drifting of Needle.**—(1) The failure of the needle of a galvanometer to remain at its zero point when no current is passing through its coils, due usually to variation in the condition of the magnetic needle, to variation in the torsion of the suspending system, or to local or other causes. (2) Elastic fatigue in the suspension of a magnetic system.

**Drifting of Zero Point.**—A term frequently employed for the shifting of the zero point.

**Drilling, Electric.**—(1) A term sometimes employed for the use of the voltaic arc in perforating a mass of metal or mineral. (2) Drilling by means of an electrically operated tool.

**Drop Loop.**—A loop inclined upwards at the point where outside conductors enter a building, so that the rain-water flows along said loop from the building, instead of towards it.

**Driven Circuit of Transformer.**—The secondary circuit of a transformer.

**Driven Coil of a Transformer.**—The secondary coil of a transformer.

**Driven Pulley.**—A pulley which receives its motion from a driving shaft.

**Driven Pulley of Dynamo.**—The pulley connected with the armature shaft of a dynamo.

**Driven Shaft.**—The shaft worked by a belt from the driving pulley.

**Driving Circuit of Transformer.**—The primary circuit of a transformer.

**Driving Coil of a Transformer.**—The primary coil of a transformer.

**Driving Current of Motor.**—The current which operates an electric motor.

**Driving E. M. F.**—The impressed or working E. M. F.

**Driving Gear of Magneto.**—The gear wheels connecting a magneto telephone-transmitter armature with the driving handle, whereby the speed of revolution of the armature is increased.

**Driving Horns.**—In a smooth-cored armature, mechanical projections for holding the armature wires in place, and communicating their electro-magnetic force to the armature.

**Driving Pressure.**—The driving or impressed E. M. F.

**Driving Pulley.**—That pulley of a machine which is mounted on the driving shaft.

**Driving Pulley of Motor.**—The pulley attached to the shaft of a motor, or the pulley through which a motor furnishes its mechanical power.

**Driving Shaft.**—The shaft connected directly with a prime mover.

**Driving Spider.**—The radial arms or spokes connected to the armature of a dynamo, and keyed to its shaft, so as to act as a driving wheel for the armature.

**Drop.**—(1) A word frequently used for drop of potential, pressure, or electromotive force. (2) The fall of potential which takes place in an active conductor by reason of its resistance.

**Drop.**—A shutter, or falling armature, of a drop annunciator.

**Drop Annunciator.**—An electro-magnetic annunciator, which, on being energized, releases a shutter and allows the same to drop.

**Drop-Handle.**—In single-needle telegraphy, a form of transmitter handle.

**Drop Indicator.**—A drop annunciator.

**Drop of Magneto Potential.**—A fall of magnetic potential.

**Drop of Potential.**—The fall of potential, equal in any part of a circuit to the product of the current strength and the resistance of that part of the circuit.

**Drop of Telephone Switchboard.**—A small electro-magnetic annunciator inserted in the line of each subscriber,

whereby any current received from a subscriber attracts the armature of the electro-magnet and releases the shutter, thereby indicating the number of the particular subscriber calling.

**Drop of Voltage.**—The drop or difference of potential of any part of a circuit.

**Drop Relay-Contact.**—A form of relay-contact in which, on the passage of a current, the attraction of an armature releases a drop and thus completes a local circuit, which remains closed until the drop is reset.

**Drop-Shutter of Annunciator.**—The drop of an electro-magnetic annunciator.

**Drop-Trolley.**—A particular form of trolley wheel and pole which employs a swivel joint and springs forcing the trolley against the wire.

**Drop-Trolley Stand.**—A support for a trolley pole or mast provided with a swivel joint and suitable springs for ensuring a firm pressure of the trolley wheel against the trolley wire.

**Drum.**—A reel for holding wire or cable.

**Drum Armature.**—A dynamo armature whose coils are wound longitudinally over the surface of a cylinder or drum.

**Drum Armature-Winding.**—The winding employed on a drum armature.

**Dry Battery.**—(1) A number of separate dry voltaic cells, connected so as to act as a single source. (2) A dry pile.

**Dry Cable.**—A dry-core cable.

**Dry Cell.**—A dry voltaic cell.

**Dry-Core Cable.**—A cable whose core is wrapped with paper or cotton which is not afterwards filled with paraffine, gutta-percha, or other insulating material, and, consequently, whose dielectric consists largely of dry air.

**Dry Distillation.**—A species of destructive distillation.

**Dry Electrode.**—A therapeutic electrode applied in a dry state.

**Dry Front of Microscopic Objective.**—That front of a microscopic object glass which is turned towards the object, but is separated from it by a short distance or air gap in contradistinction to an immersion lens.

**Dry Gelatine Cell.**—A type of dry voltaic cell in which the fluid electrolyte is absorbed by, or combined with, a suitable gelatinous substance.

**Dry Pile.**—A dry battery.

**Dry Transformer.**—An air-insulated transformer, as distinguished from an oil-insulated transformer.

**Dry Voltaic Cell.**—(1) A misnomer for a voltaic cell in which the fluid electrolyte is held in suspension by saw-dust, gelatin, or other suitable material. (2) A sealed voltaic cell, which can, therefore, be inverted without danger of spilling liquid.

**Dual Electrolysis.**—A term sometimes employed to denote the double decomposition that attends the electrolysis of a metallic salt; viz. that of the salt and its solvent.

**Dub's Laws.**—A set of experimentally established laws relating to the attractive and repulsive magnetic forces developed by electromagnets under various conditions, of which the following are two:—“The attraction of V-shaped electromagnets with an equal number of windings is proportional to the square of the magnetizing current strength.” “The attraction of V-magnets is, with equal currents, proportional to the square of the number of windings of the magnetizing spools.”

**Duct.**—A space left in an underground conduit for a separate wire or cable.

**Duct of Conduit.**—The space provided in a conduit for a conductor or cable.

**Dumb-Bell Vibrator.**—An electric vibrator consisting of two spheres connected by a straight conductor containing an air-gap.

**Dummy Moulding.**—A moulding not intended for the reception of a wire but a part of an ornamentation, the moulding being symmetrically arranged on the ceiling with an electrolier as a centre with only one or a few of the mouldings actually having wires placed in them.

**Duopod.**—A two-legged screw support for a pendant or upright.

**Duplex Balance.**—The condition of a duplex telegraphic line, in which the same instruments are unaffected by the sending signals, and are, therefore, ready to respond to the received signals.

**Duplex Cable.**—A cable containing two separate conductors placed parallel to each other.

**Duplex Circuit.**—(1) A circuit arranged for duplex transmission. (2) A metallic circuit.

**Duplex Cut-Out.**—A cut-out so arranged that when one bar or strip is fused or melted by an abnormal current, another can be immediately substituted for it.

**Duplex Electrolysis.**—A term sometimes used for dual electrolysis.

**Duplex Flat-Cable.**—A flat laid-up cable containing two wires.

**Duplex Loop.**—A loop or pair of wires

leading to a branch office, whereby a branch office can be brought into connection with a duplex set placed at the main office, for the duplex sending and reception of messages at said branch office.

**Duplex Telegraph.**—A general term embracing the apparatus employed in duplex telegraphy.

**Duplex Telegraphic Insulator.**—A double telegraph insulator.

**Duplex Telegraphy.**—A system of telegraphy whereby two messages can be simultaneously transmitted in opposite directions over a single wire.

**Duplex Telephony.**—Duplex telephonic transmission.

**Duplex Transmission.**—The sending of two telegraphic or telephonic messages simultaneously in opposite directions over the same wire.

**Duplex Wire.**—An insulated conductor containing two separate parallel wires.

**Duplex Working.**—Duplex transmission.

**Duplexed-Duplex Telephony or Telegraphy.**—Quadruplex telephony or telegraphy.

**Duplicate Arc.**—A multiple arc containing but two branches.

**Duration of Electric Discharge.**—The time required to effect a complete disruptive discharge.

**Dust Telephone-Transmitter.**—(1) A form of microphone transmitter in which finely granulated carbon or carbon dust is contained within a suitably shaped box, connected with the terminals of the transmitter. (2) A granular telephone transmitter.

**Dyad.**—(1) A chemical element which has two bonds by which it can unite or combine with other elements. (2) A bivalent element.

**Dyad Atom.**—An atom whose valency, atomicity, or combining power, is two.

**Dyeing, Electric.**—The application of electricity either to the reduction or to the oxidation of the salts used in dyeing.

**Dynamic Electricity.**—A term sometimes employed for current electricity, in contradistinction to static electricity. (*Obsolete.*)

**Dynamic Induction.**—(1) A term sometimes employed for mutual induction. (2) Kinetic induction.

**Dynamic Multiplier.**—(1) A term sometimes employed for a self-induction coil or a coil possessing self-induction. (2) A spark coil.

**Dynamic System of Induction Telegraphy.**—A term sometimes used for the current system of induction telegraphy, as distinguished from an electrostatic system of induction telegraphy.

**Dynamics.**—That branch of mechanics which treats of the action of a force in producing motions or pressures.

**Dynamo.**—A dynamo-electric machine or generator.

**Dynamo Armature-Coils.**—The coils employed on the armature of a dynamo-electric machine.

**Dynamo Balancing-Rheostat.**—An adjustable rheostat whose range is sufficient to balance the current of one dynamo against that of another, with which it is required to operate in parallel.

**Dynamo Battery.**—The combination of several separate dynamos to act as a single electric source.

**Dynamo Brush-Holders.**—Devices for supporting the collecting brushes of dynamo-electric machines.

**Dynamo Brush-Trimner.**—A device for rapidly ensuring the accurate trimming of dynamo brushes.

**Dynamo Changing-Switch.**—A switch designed to throw a dynamo from one circuit to another.

**Dynamo-Electric Generator.**—A dynamo-electric machine.

**Dynamo-Electric Machine.**—(1) A machine for the conversion of mechanical energy into electric energy, by means of electro-dynamic induction. (2) A dynamo.

**Dynamo-Electric Machine Battery.**—A dynamo battery.

**Dynamo or Motor Frame.**—The iron body of a dynamo or motor, including the pole-pieces and standards, but excluding the base-plates and bearings.

**Dynamo or Motor Standards.**—The supports on which a dynamo or motor armature rests.

**Dynamo Pole-Changer.**—A pole-changing transmitter employed in a system of duplex or quadruplex telegraphy.

**Dynamo Power.**—The power of a motor to act as a generator.

**Dynamo Power of a Motor.**—(1) A power possessed by an electric motor of producing counter-electromotive force. (2) The number of volts of counter-electromotive force produced by a motor per revolution per-second.



**Dynamo Regulator.**—A name given to a form of rheostat employed in the regulation of a dynamo.

**Dynamo Resistance Box.**—A form of rheostat employed in the regulation of a dynamo.

**Dynamo Terminals.**—The main terminals of a dynamo.

**Dynamograph.**—A term sometimes applied to a typewriting telegraph that records the messages in typewritten characters, both at the receiving and transmitting ends of the line.

**Dynamograph, Electric.**—A device for electrically recording the work done by any machine.

**Dynamometer.**—A general name given to a variety of apparatus for measuring power.

**Dynamometric Governor.**—A dynamometer employed on the shaft of an

electric motor for the purpose of operating a regulating apparatus.

**Dynamotor.**—(1) A particular type of rotary transformer. (2) A motor-generator, in which a generator and motor armature-winding are rotated through a common magnetic field.

**Dynamotor Windings.**—Windings required for the armatures of the dynamo and motor of a dynamotor.

**Dyne.**—(1) The C. G. S. unit of force. (2) The force which in one second can impart a velocity of one centimetre-per-second to a mass of one gramme.

**Dyne-cm.**—An abbreviation proposed for a dyne-centimetre, the C. G. S. unit of work.

**Dyne: cm<sup>2</sup>.**—An abbreviation proposed for a dyne-per-square-centimetre, the C. G. S. unit of pressure.

**Dyne-Centimetre-Per-Second.**—The C. G. S. unit of activity.

## E

**E. or e.**—A symbol for electromotive force.

**E.**—A contraction sometimes used for earth.

**E. H. P.**—A contraction for electrical horse-power.

**E. M. F.**—A contraction for electromotive force.

**E. M. F. of Self-Induction.**—The E. M. F. generated in a loop of wire during the filling or emptying of that loop by magnetic flux from its own current.

**Ear.**—(1) A metal piece supported by an insulator to which the trolley wire is fastened. (2) A trolley ear.

**Ear Piece.**—A circular opening into an air chamber placed over the diaphragm of a telephone, suitably shaped to permit the ready application of the listener's ear.

**Earth.**—(1) A fault in a telegraphic or other line caused by the accidental contact of the line with the ground or earth, or with some other ground-connected conductor. (2) That part of the earth or ground which forms a part of an electric circuit.

**Earth-Battery Current.**—A current on a telegraph line caused by voltaic action between two dissimilar earth plates, as distinguished from a true earth current.

**Earth Cell.**—A term frequently applied to a variety of voltaic cell, consisting of any voltaic couple buried in a comparatively moist stratum of earth.

**Earth Circuit.**—A circuit in which the ground or earth forms part of the conducting path.

**Earth-Circuited Conductor.**—A conductor connected to the ground or to an earth-connected circuit.

**Earth Coil for Magnetic Measurement.**—A coil capable of being moved about a fixed axis, or fixed axes, employed for generating a measurable E. M. F. from the earth's magnetic field.

**Earth Connection.**—A conductor which establishes a connection between any apparatus or circuit and ground.

**Earth Currents.**—Electric currents flowing through the earth, caused by the difference of potential of its different parts.

**Earth Currents of Cable.**—Currents in a cable due to natural causes, such as climatic conditions or magnetic disturbances, as distinguished from the currents sent through the cable for the transmission of messages.

**Earthenware Conduit.**—A conduit, generally multiduct, made of glazed earthenware.



**Earth-Grounded Wire.**—A wire one terminal of which is grounded or put to earth, so that the earth forms a part of the circuit in which it is placed.

**Earth Indicator.**—An instrument suitable for the accurate determination of the magnetic inclination and the calibration of ballistic galvanometers.

**Earth Overlap Test.**—A localization test for the position of a partial earth in a telegraph line, conducted alternately by observers at each end of the line, the line being grounded at one end while its resistance is measured at the other, and resistance is added to one end until the fault is brought to the centre of the circuit.

**Earth Plates.**—Plates of metal, buried in the earth or in water, connected to the terminals of earth wires.

**Earth Return.**—That portion of a grounded circuit in which the earth forms its conducting path.

**Earth Strip.**—In a multiple telephone switchboard a strip of metal, or top plate of a series of jacks, permanently connected to earth through a battery, to furnish connections for the busy test.

**Earth-Switch for Telephone.**—(1) In a single-cord multiple telephone-switchboard, a device for maintaining a ground-connection with the shank of a plug when out of use, by supporting the plug, friction light, against a ground-connected bar. (2) A switch at a telephone switchboard for automatically grounding the sleeve of a plug when out of use.

**Earth Wires.**—The wires that lead an earth-grounded circuit to the earth plates.

**Earth's Field.**—The magnetic field produced in any place by the earth's flux.

**Earth's Flux.**—The magnetic flux produced by the earth by virtue of its magnetized condition.

**Earthed.**—Connected to earth or ground.

**Earthing.**—Connecting a line or conductor to earth or ground.

**Earthing Device.**—An instrument for automatically making connection between a system of wiring and the earth, should the potential between them rise beyond a certain predetermined safe limit.

**Earthkin.**—A terella.

**Easement.**—A permit obtained from the owner of a property for the erection of poles or attachments for telephone, telegraph, or other aerial lines.

**Ebonite.**—(1) A hard, tough, black substance, composed of India rubber and

sulphur, possessing both high powers of insulation and high specific inductive capacity. (2) Vulcanite.

**Economic Coefficient.**—The ratio between the net electric power, or the output of a dynamo, and the gross electric power, or power actually converted in the dynamo.

**Economic Coefficient of Dynamo-Electric Machine.**—(1) The ratio between the electric power produced by a dynamo at its terminals, and the mechanical power expended in driving it. (2) A term sometimes employed for the ratio of the useful electric power at the terminals to the total electric power developed in the machine.

**Economy Coil.**—A choking coil employed for the purpose of reducing the pressure on arc lamps fed by step-down transformers.

**Eddy Conduction-Currents.**—(1) Eddy currents. (2) Foucault currents.

**Eddy-Current Loss.**—The loss of energy in a dynamo, motor, transformer, or similar apparatus, due to the presence of eddy currents.

**Eddy Currents.**—Useless currents produced in the pole-pieces, armature, and field-magnet cores of dynamos or motors, or in metallic masses generally, either by their motion through magnetic flux, or by variations in the strength of electric currents flowing near them.

**Eddy Displacement-Currents.**—Eddy currents produced in the mass of a dielectric or insulator, by the passage through it of electrostatic or magnetic flux.

**Edgewise System.**—A system of mounting central-station switchboard instruments, in which, for the purpose of economizing space, their scales are presented edgewise vertically to the switchboard face.

**Edison Distributing-Box.**—A distributing box employed in the Edison three-wire system of distribution.

**Edison Effbot.**—An electric discharge which occurs between one of the terminals of the incandescent filament of an electric lamp and a metallic plate placed near but disconnected from the filament as soon as a certain difference of potential is reached between the lamp terminals.

**Edison Electric-Tubes.**—The underground tubes employed in the Edison three-wire system of distribution.

**Edison-Lalande Cell.**—A zinc-copper couple in which the copper is covered

with a depolarizing layer of copper-oxide, and the couple immersed in an electrolyte of caustic soda or potash.

**Eel, Electric.**—(1) An eel possessing the power of giving powerful electric shocks. (2) The *gymnotus electricus*.

**Effective Ampere-Turns.**—(1) The resultant magnetizing force in a magnetic circuit. (2) The square root of the mean square of the ampere-turns in a periodically-varying magnetizing force.

**Effective Conductance.**—(1) The ratio in an alternating-current circuit of the real electric power, or real activity, to the square of the effective pressure. (2) The virtual conductance of a circuit. (3) In an alternating-current circuit the ratio of the energy component of current to the total E. M. F.

**Effective Current-Strength.**—(1) The strength of an alternating or sinusoidal electric current, determined by its heating effect; or, in other words, the thermally effective current strength. (2) That value of the current strength of a sinusoidal or alternating current which is equal to the square root of the mean square of the instantaneous values of the current during one or more cycles. (3) The square root of the time average of the square of the current.

**Effective Electromotive Force.** (1) The difference between the direct and the counter-electromotive force. (2) The square root of the time average of the square of the E. M. F. (3) The virtual E. M. F.

**Effective M. M. F.**—The square root of the time average of the square of a periodically-alternating M. M. F.

**Effective Reactance.**—(1) In an alternating-current circuit, the ratio of the wattless component of an electromotive force to the total current. (2) Apparent reactance.

**Effective Resistance.** In an alternating-current circuit, the ratio between the energy component of an electromotive force and the total current.

**Effective Secondary-Electromotive Force.**—(1) The vector difference between the direct and counter-electromotive force in the secondary of an induction coil. (2) The E. M. F. in a secondary circuit expended in overcoming resistance. (3) The square root of the time average of the square of a secondary E. M. F.

**Effective Starting-Current of Motor.**—The indicated value of the starting current of a motor as observed on an ammeter.

**Effective Susceptance.**—(1) In an alternating-current circuit, the ratio of the wattless component of a current to its total electromotive force. (2) Apparent susceptance.

**Efficiency.**—The ratio between the produced and the expenditure of energy to produce that effect.

**Efficiency of Voltaic Battery.**—(1) The ratio between the actual ampere-hour output per gramme of zinc dissolved, and the theoretical ampere-hour output. (2) The ratio of the energy delivered at the terminals of a battery to the theoretical energy liberated within the cells. (3) The ratio of the energy at terminals to the total electric energy.

**Effective Value of Periodic Current E. M. F.**—(1) The square root of the mean square of the current or E. M. F. extended over one or more cycles. (2) The virtual current or E. M. F.

**Efficiency, Electric.**—The useful electric energy delivered at the terminals of a source to its external circuit, divided by the total electrical energy within the source.

**Efficiency of Dynamo, Electric.**—The ratio of the electrical output of a dynamo, divided by the total electric activity in its circuit.

**Efficiency of Conversion.**—The ratio between the energy present in an armature and the energy expended in producing that result.

**Efficiency of Conversion of Dynamo.**—The total electric energy developed by a dynamo, divided by the total mechanical energy required to drive the dynamo.

**Efficiency of Distribution.**—The ratio of the units of electric quantity or electric energy sold, or distributed to consumers from a central station, to the units generated in that station.

**Efficiency of Electric Lamp.**—(1) The ratio of the luminous energy emitted by an incandescent lamp to the energy supplied by the lamp. (2) The number of candles which can be produced from an electric lamp to the electric activity in the lamp expressed in watts. A term in common but inaccurate is the ratio of the number of watts consumed by a lamp to the number of candles it produces, expressed in candles.

**Efficiency of Electric Motor.**—(1) The ratio of the power delivered at a pulley to the electric power supplied at its terminals. (2) The ratio between the useful mechanical power delivered

motor and the electrical power put in to drive it.

**Efficiency of Radiation.**—The ratio of the luminous activity of a luminous body to its radiation activity.

**Efficiency of Secondary Battery.**—(1) The ratio of the electric quantity of discharge in ampere-hours to the electric quantity in a charge. (2) The ratio of the electric energy of discharge in watt-hours to the electric energy of charge.

**Efficiency of Transformer or Converter.**—The ratio of the power supplied at the secondary terminals of a transformer or converter to the power supplied at its primary terminals.

**Efflorescence.**—(1) Pulverulence or crumbling of crystalline salts, due to the loss of their water of crystallization on drying. (2) A term loosely applied to the deposition of solid matter above the line of liquid on the surface of a vessel containing a vaporizing same solution, by the crystallization of the salt.

**Effluvia.**—The name given to a variety of assumed highly tenuous imponderable forms of matter that were formerly believed to be given off by electrified or magnetized bodies.

**Effluvium, Electric.**—A term employed in the early history of electricity for the supposed highly-tenuous, imponderable matter given off from an electrified body, which was assumed to be the cause of electric phenomena.

**Efflux.**—The flow or quantity of liquid escaping in a given time from an orifice in a containing vessel.

**Egg, Electric.**—An egg-shaped vessel containing a partial vacuum through which an electric discharge is passed, for the purpose of producing luminous effects.

**Elastance.**—(1) The reciprocal of the electrostatic capacity. (2) The reciprocal of permittance.

**Elastic.**—(1) Of or pertaining to elasticity. (2) Possessing elasticity.

**Elasticity.**—That property of a body in virtue of which its original configuration or form is regained, after a strain or distortion has been produced in it by the action of a stress.

**Elasticity, Electric.**—The quotient arising from dividing the electric strain by the electric stress.

**Elastivity.**—The reciprocal of permittivity.

**Elbow Connection.**—A connection at an angle more or less approaching 90°.

**Elbow Connector.**—A connector suitable for connecting conductors at an elbow.

**Electrepeter.**—An old term for switch, key, or pole-changer. (Obsolete.)

**Electret.**—(1) A name proposed for a substance possessing natural or inherent electrization. (2) A permanently polarized body.

**Electric.**—Of or pertaining to electricity.

**Electrical.**—An orthography for electric.

**Electrically.**—In an electrical manner.

**Electrically Conducting.**—Transferring electricity by electric conduction.

**Electrically Controlled Clock.**—A clock that is controlled, either wholly or partially, by electricity.

**Electrically Discharging.**—Equalizing differences of potential by connecting them with a conductor.

**Electrically Energizing.**—Causing electricity to produce any effect in an electro-receptive device.

**Electrically Illumined Buoy.**—An electrically lighted buoy.

**Electrically Retarded.**—Decreased speed of telegraphic signalling by means of electrostatic induction.

**Electrically Tuned System.**—Any circuit or system of circuits that have been brought into electric resonance with another circuit or system of circuits.

**Electrician.**—One versed in the principles and applications of electricity.

**Electricity.**—The name given to the unknown cause of electric phenomena.

**Electricity Driving-Force.**—A term sometimes used for electromotive force.

**Electricity Meter.**—(1) A coulombmeter. (2) A term sometimes used for electric meter.

**Electrics.**—A term formerly applied to substances capable of becoming electrified by friction. (Obsolete.)

**Electrifiable.**—Capable of being endowed with electric properties.

**Electrification.**—The production of an electric charge.

**Electrified.**—Endowed with an electric charge.

**Electrified Body.**—A charged body.

**Electrify.**—To endow with electric properties.

**Electrine.**—Of or pertaining to electrum or amber.



**Electripherous.**—An unnecessary word proposed for anything capable of bearing or transmitting electricity.

**Electrization.**—Electrification.

**Electrize.**—To electrify or endow with an electric charge.

**Electrizer.**—Anything which electrifies or charges a body with electricity.

**Electro - Anæsthesia.**—Insensibility to pain produced by the use of electricity.

**Electro-Ballistics.**—The application of electricity to the determination of the velocity of projectiles.

**Electro-Bath.**—The liquid or fluid employed in electro-plating.

**Electro-Biological.**—Pertaining to electro-biology.

**Electro-Biologist.**—One skilled in electro-biology.

**Electro-Biology.**—That branch of electric science which treats of the condition of living animals and the effects of electricity upon them.

**Electro-Bioscopist.**—One skilled in electro-bioscopy.

**Electro-Bioscopy.** The determination of the existence of life or death by the passage of electricity through the muscles and nerves.

**Electro-Brassing.**—(1) The electrolytic deposition of brass from a solution containing salts of zinc and copper. (2) Coating a surface with a layer of brass by electro-plating.

**Electro-Calorimetry.**—The art of measuring the quantity of heat developed in any conductor or circuit by an electric current.

**Electro-Capillarity.**—The science which treats of the mutual effects between electricity and capillarity.

**Electro-Capillary.**—Of or pertaining to electro-capillarity.

**Electro - Capillary Electrometer.**—A capillary electrometer.

**Electro-Capillary Light.**—A bright light obtained by the discharge of an induction coil through a narrow capillary tube provided with aluminium or copper electrodes, and filled with air at ordinary pressures.

**Electro-Capillary Phenomena.**—Electric phenomena observed in capillary tubes at the contact surfaces of two liquids.

**Electro-Capillary Telephone.**—A telephone transmitter whose operation depends on the electric currents produced

by forcing a liquid through a bundle of capillary tubes, by the to-and-fro movements of the diaphragm.

**Electro-Chemical.**—Of or pertaining to electro-chemistry.

**Electro-Chemical Accumulator.**—A storage battery.

**Electro-Chemical Actinometer.**—(1) An actinometer employing electrolytic action. (2) An electric actinometer.

**Electro-Chemical Decomposition.**—Electrolytic decomposition.

**Electro-Chemical Filtration.**—A method formerly employed in place of endosmose.

**Electro-Chemical Meter.**—An instrument in which the current passing is measured by the amount of electrolytic decomposition it effects.

**Electro-Chemical Telephone.**—A method sometimes given to the Edison photographic telephone.

**Electro-Chemical Series.**—A list of chemical elements so arranged that they will displace from its compound an element lower in the list than itself.

**Electro - Chemically.**—In an electro-chemical manner.

**Electro - Chemist.**—One skilled in the science of electro-chemistry.

**Electro-Chemistry.**—(1) That branch of electric science which treats of the combinations and decompositions effected by the electric current. (2) The science which treats of the relation between the laws of electricity and chemistry.

**Electro-Chromic Rings.**—(1) A method sometimes applied to metallochromy. (2) Nobil's rings.

**Electro-Chronographic.**—Of or pertaining to the electric chronograph.

**Electro-Chronometric Counter.**—An apparatus employed in a system of electric clocks to enable the master clock to control or operate a number of separate or secondary clocks.

**Electro - Coppering.**—Electro-plating with copper.

**Electro-Crystallization.**—Crystallization effected during electrolytic deposition.

**Electro-Culture of Plants.**—Stimulating the growth of plants by electricity.

**Electro-Deposit.**—A coating or plating of metal.

**Electro-Depositor.**—One who practices the art of electro-deposition.

**Electro - Deposition.**—(1) The deposition of a metallic substance, by



of electrolysis. (2) Electrolytic deposition.

**Electro-Deposits.**—Electrolytic deposits.

**Electro-Diagnosis.**—Diagnosis by means of the exaggeration or diminution of the reaction of the excitable tissues of the body when subjected to the varying influences of electric currents.

**Electro-Diagnostic.**—Of or pertaining to electro-diagnosis.

**Electro-Diapason.**—An electro-magnetically operated tuning-fork.

**Electro-Dynamic Attraction.**—The mutual attraction existing between electric currents or between conductors through which electric currents are passing.

**Electro-Dynamic Balance.**—A balance form of electro-dynamometer.

**Electro-Dynamic Capacity.**—A term sometimes employed for self-induction.

**Electro-Dynamic Force.**—A mechanical force exerted on the substance of a wire or conductor due to the dissymmetrical distribution of magnetic flux in its neighborhood.

**Electro-Dynamic Induction.**—Electro-motive forces set up by induction in conductors which are either actually or practically moved so as to cut magnetic flux.

**Electro-Dynamic Interrupter.**—An interrupter for the primary circuit of an induction coil, consisting of an elastic wire stretched, like the wire of a sonometer or monochord, between the poles of a permanent horse-shoe magnet.

**Electro-Dynamic Machinery.**—Any apparatus designed for the production, transference, utilization, or measurement of energy by the medium of electricity.

**Electro-Dynamic Motor.**—(1) A motor operated by electro-dynamic force. (2) An electric motor.

**Electro-Dynamic Potential.**—An electric potential produced by electro-dynamic induction.

**Electro-Dynamic Repulsion.**—The mutual repulsion between two electric circuits whose currents are flowing in opposite directions.

**Electro-Dynamic Rotation.**—(1) The rotation of a magnetic field produced as the resultant of two or more magnetic fields or magnetizing forces of variable intensity acting at right angles to one another, whose maxima and minima do not coincide, but whose periods are the same. (2) Rotation produced electro-dynamically.

**Electro-Dynamic Screen.**—A conducting screen employed for intercepting the

transmission of varying electro-magnetic forces.

**Electro-Dynamic Whirls.**—Whirlings, or rotary motions produced in a cloud of copper oxide in a voltameter, when the electrolyte is traversed by a powerful discharge, while under the influence of magnetic flux.

**Electro-Dynamics.**—That branch of electric science which treats of the action of electric currents on one another, on themselves, or on magnets.

**Electro-Dynamical.**—Of or pertaining to electro-dynamics.

**Electro-Dynamometer.**—A form of galvanometer suitable for the measurement of electric currents.

**Electro-Dynamometer Balance.**—A name sometimes given to a current balance.

**Electro-Etching.**—A term sometimes employed for electric engraving.

**Electro-Extraction of Ores.**—Various electric processes for extracting metals from their ores.

**Electro-Filtration.**—A term sometimes employed for electric osmose or cataphoresis.

**Electro-Genesis.**—A word proposed for the production of electricity. (Not in use.)

**Electro-Genio.**—Producing electricity. (Not in use.)

**Electro-Gild.**—To cover with a metallic coating of gold by electro-plating.

**Electro-Gilder.**—One who practises the art of electro-gilding.

**Electro-Gilding.**—(1) Electric gilding. (2) Electro-plating with gold.

**Electro-Gilt.**—Gilded by means of electricity.

**Electro-Graphy.**—Galvanography.

**Electro-Inductive Repulsion.**—Repulsion between bodies due either to the influence of electrostatically induced charges, or electromagnetically induced currents.

**Electro-Kinetic.**—Of or pertaining to electro-kinetics.

**Electro-Kinetic Energy.**—Electrical energy that is actually engaged in doing work.

**Electro-Kinetic Units.**—A term sometimes used for C. G. S. electro-magnetic units.

**Electro-Kinetics.**—A term sometimes applied to the phenomena of electric currents, or electricity in motion, as dis-

tinguished from electrostatics, or the phenomena of electric charges, or electricity at rest.

**Electro-Lithiarity.**—A term proposed for the removal of urinary calculi by electrolysis.

**Electro-Magnet.**—(1) A magnet produced by the passage of an electric current through a circuit of insulated wire. (2) A magnetizing coil surrounding a soft iron core, that is capable of being magnetized and demagnetized instantly on the closing and opening of the circuit.

**Electro-Magnetic.**—Of or pertaining to an electro-magnet or to electro-magnetism.

**Electro-Magnetic Ammeter.**—A form of ammeter in which a magnetic needle is moved against the field of an electro-magnet by the field of the current it is measuring.

**Electro-Magnetic Annunciator.**—An electro-magnetic device for automatically indicating the points or places at which one or more electric contacts have been closed.

**Electro-Magnetic Attraction.**—The mutual attraction existing between the unlike poles of electro-magnets.

**Electro-Magnetic Bell.**—An electro-magnetically operated bell.

**Electro-Magnetic Bell-Call.**—A bell-call operated by an electro-magnet.

**Electro-Magnetic Brake.**—A brake for car wheels, whose braking power is either entirely derived from electro-magnetism, or is thrown into action by electro-magnetic devices.

**Electro-Magnetic Cam.**—A form of magnetic equalizer which depends for its operation on the lateral approach of a suitably shaped polar surface.

**Electro-Magnetic Capacity of Line.**—A term sometimes used for the self-induction or inductance of a line.

**Electro-Magnetic Cut-Out.**—A cut-out operated by means of an electro-magnet.

**Electro-Magnetic Dental Mallet.**—A mallet for filling teeth, the blows of which are struck by means of an electro-magnetically driven mechanism.

**Electro-Magnetic Drill.**—A drum employed in blasting and mining operations, operated by means of electricity.

**Electro-Magnetic Drum.**—A drum used in frats of leverdomain operated by means of an automatic electro-magnetic contact-breaker.

**Electro-Magnetic Engine.**—An motor.

**Electro-Magnetic Explorer.**—A instrument operated by means of inducements, and formerly employed for the purpose of locating bullets, or other metallic substances in the human body.

**Electro-Magnetic Eye.**—(1) A instrument applied to a certain form of spectrometer, employed by Hertz in his experiments on electro-magnetic radiation. (2) A term sometimes applied to a heretofore.

**Electro-Magnetic Field.**—The field produced either by an electro-magnet or by an electric current.

**Electro-Magnetic Flux.**—Magnetic flux produced by means of an electro-magnet or by an electric current.

**Electro-Magnetic Gyroscope.**—A gyroscopically driven gyroscope.

**Electro-Magnetic Helix.**—An electro-magnetic solenoid.

**Electro-Magnetic Impulse.**—A pulse produced in the ether surrounding a conductor by the action of an electric discharge, or by a pulsating field.

**Electro-Magnetic Induction.**—A variety of electrodynamic induction in which electric currents are produced by the motion either of electro-magnets or of electro-magnetic solenoids.

**Electro-Magnetic Inertia.**—A term sometimes employed for the inductance or self-induction of a current.

**Electro-Magnetic Interference.**—The interference of electro-magnetic waves.

**Electro-Magnetic Intermittent.**—An electro-magnetic vibrator.

**Electro-Magnetic Medium.**—A medium in which electro-magnetic phenomena occur, or through which magnetic waves are transmitted.

**Electro-Magnetic Meter.**—An instrument in which the current is measured by the electro-magnetic force it produces.

**Electro-Magnetic Mine-Explorer.**—A small magneto-electric machine used in the direct firing of blasts.

**Electro-Magnetic Momentum.**—The product of the inductance of a circuit by the current strength it carries.

**Electro-Magnetic Motor.**—An electro-magnetic motor.

**Electro-Magnetic Multiplier.**—A multiplier sometimes employed for Schlegel's multiplier.

**Electro-Magnetic Optical-Strain.**—Any optical strain produced by electro-magnetic stress.

**Electro-Magnetic Pop-Gun.**—A magnetizing coil, provided with a tubular space for the insertion of a core much shorter than the length of the coil, which is violently projected when the coil is energized by a current.

**Electro-Magnetic Radiation.**—The radiation, from any conductor through which oscillatory discharges are passing, of electro-magnetic waves similar in all respects to those of light, save in their much greater wave length.

**Electro-Magnetic Repeater.**—A word formerly employed for a form of vibrating contact-breaker.

**Electro-Magnetic Repulsion.**—The mutual repulsion produced by two similar electro-magnetic poles.

**Electro-Magnetic Resonator.**—A term sometimes applied to a Hertz spark micrometer, in which electro-magnetic waves are produced by electric resonance.

**Electro-Magnetic Retardation.**—A retardation in the magnetization or demagnetization of a substance.

**Electro-Magnetic Rotation.**—Rotation obtained by electro-magnetic attractions and repulsions.

**Electro-Magnetic Separator.**—(1) A device for separating iron ore from the dross, in finely-pulverized, low-grade iron ores. (2) A device for magnetically removing particles of iron from brass filings or other non-magnetic material, and thus freeing such material from impurities.

**Electro-Magnetic Shunt.**—(1) In a system of telegraphic communication, an electro-magnet whose coils are placed in a shunt circuit around the terminals of the receiving instrument. (2) Any shunt coil provided with a magnetic core.

**Electro-Magnetic Solenoid.**—(1) A cylindrical coil of wire, each convolution of which is circular. (2) An electro-magnetic helix. (3) A cylindrical current sheet.

**Electro-Magnetic Sorter.**—An electro-magnetic separator.

**Electro-Magnetic Strain.**—The effect produced by an electro-magnetic stress.

**Electro-Magnetic Stress.**—The force or pressure in an electro-magnetic field which produces a strain or deformation in a piece of glass or other substance placed therein.

**Electro-Magnetic Telegraph.**—A general term embracing the apparatus employed in a system of electro-magnetic telegraphy.

**Electro-Magnetic Telegraphy.**—(1) A system of telegraphy employing or based upon electro-magnetism. (2) The ordinary Morse telegraphy.

**Electro-Magnetic Temperature-Regulator.**—A temperature regulator whose operation is dependent on the action of an electro-magnet which is thrown into operation by the expansion or contraction of a solid liquid or gas.

**Electro-Magnetic Twist or Pull.**—The torque of an electro-magnetic motor.

**Electro-Magnetic Units.** (1) A system of C. G. S. units employed in electro-magnetic measurements. (2) Units based on the attractions and repulsions capable of being exerted between two unit magnetic poles at unit distance apart, or between a unit magnetic pole and a unit electric current.

**Electro-Magnetic Vibrator.**—A name sometimes given to an automatic contact-breaker.

**Electro-Magnetic Waves.**—Waves in the ether, given off from a circuit through which an oscillatory discharge is passing, or from a magnetic circuit undergoing variations of magnetic intensity.

**Electro-Magnetic Voltmeter.**—A form of voltmeter in which the difference of potential is measured by the movements of a magnetic needle in the field of an electro-magnet.

**Electro-Magnetics.**—That branch of electric science which treats of the relations that exist between electric circuits and magnets.

**Electro-Magnetism.**—Magnetism produced by means of electric currents.

**Electro-Magnetist.**—One skilled in the art of electro-magnetism. (Not in use.)

**Electro-Massage.**—The application of electricity to the body during its massage.

**Electro-Mechanical Alarm.**—A mechanically operated alarm that is started or set in operation by means of an electric current.

**Electro-Mechanical Bell.**—A bell whose striking apparatus is mechanically operated, when called into action by an electro-magnet.

**Electro-Mechanical Gong.**—A gong struck or operated by mechanical force, at times which are dependent on the passage of an electric current.



**Electro-Mechanical Indicator.**—A mechanical indicator that is started or set into action by electricity.

**Electro-Medical.**—Of or pertaining to electricity employed electro-therapeutically.

**Electro-Medical Apparatus.**—A general term for any apparatus employed in electro-therapeutic treatment.

**Electro-Metallurgical Circuit.**—An electric circuit employed in electro-metallurgical processes.

**Electro-Metallurgical Galvanization.**—A process of covering any conducting surface with a metallic coating by electrolytic deposition, such, for example, as the thin copper coating deposited on the carbon electrodes used in arc-lights.

**Electro-Metallurgical Deposit.**—A metallic deposit thrown down on a conducting surface by electrolysis.

**Electro-Metallurgical Dipping.**—A process for obtaining an electro-metallurgical deposit on a metallic surface by dipping it in a solution of a readily decomposable metallic salt.

**Electro-Metallurgical Galvanization.**—The electro-therapeutic effects produced on nerves or muscles by the passage of an electric current.

**Electro-Metallurgy.**—(1) That branch of electric science which relates to the electric reduction or treatment of metals. (2) Electro-metallurgical processes effected by the agency of electricity. (3) Electro-plating or electro-typing.

**Electro-Motion.**—Motion produced by electricity.

**Electro-Motor.**—A term sometimes employed for a voltaic couple.

**Electro-Muscular.**—Of or pertaining to the influence of electricity on the muscles.

**Electro-Muscular Excitation.**—In electro-therapeutics, the galvanic or faradic excitation of a muscle, or its excitation by the continuous current from a voltaic battery, or by the alternating currents from an induction coil.

**Electro-Negative.**—(1) In such a state as regards electricity as to be repelled by bodies negatively electrified, and attracted by those positively electrified. (2) The ions or radicals which appear at the anode or positive electrode of a decomposition cell.

**Electro-Negative Ions.**—(1) The negative ions, or groups of atoms or radicals, which appear at the anode or positive terminal of a decomposition cell. (2) The anions.

**Electro-Negative Radicals.**—The electro-negative ions.

**Electro-Negatively.**—In an electro-negative manner.

**Electro-Negatives.**—(1) The anions or electro-negative ions of a radical. (2) The atoms or radicals that appear at the anode or positive terminal of any source during electrolysis.

**Electro-Nervous Excitability.**—The electro-therapeutic excitation of a nerve.

**Electro-Nickeling.**—Electro-plating with nickel.

**Electro-Optics.**—That branch of science which treats of the general relations existing between light and electricity.

**Electro-Pathic.**—Of or pertaining to electro-pathology.

**Electro-Pathology.**—Diagnosis by means of electricity.

**Electro-PerCUSSION Drill.**—(1) A drill employed for quarrying or mining in which a reciprocating motion for the drill is obtained by sending an electric current alternately through one or the other of a pair of solenoids of which the drill rod forms the core. (2) Any reciprocating drill operated electrically.

**Electro-Photometer.**—An instrument for measuring the intensity of light by means of electricity.

**Electro-Photo-Micography.**—Photography of the magnified images of microscopic objects illuminated by the electric light.

**Electro-Physiological.**—Of or pertaining to electro-physiology.

**Electro-Physiologist.**—One skilled in electro-physiology.

**Electro-Physiology.**—The study of electric phenomena of living animals and plants.

**Electro-Plating.**—The process of covering any conducting surface with a metal, by the aid of an electric current.

**Electro-Plating Bath.**—A tank containing a metallic solution in which articles are placed to be electro-plated.

**Electro-Pneumatic.**—Of or pertaining to the combined action of electricity and air pressure.

**Electro-Pneumatic Block System.**—A block system for railroads in which the semaphores are operated pneumatically under the control of electro-magnetically operated valves.

**Electro-Pneumatic Signals.**—Signals operated by diaphragms or pistons.



moved by compressed air, under electric control.

**Electro-Pneumatic Thermostat.**—An instrument for automatically indicating the existence of a given temperature by the closing of an electric circuit, on the expansion or contraction of a gas.

**Electro-Polar.**—Possessing electric poles.

**Electro-Positive.**—(1) In such a state, as regards an electric charge, as to be attracted by a body negatively electrified, and repelled by a body positively electrified. (2) The ions or radicals which appear at the cathode or negative electrode of a decomposition cell.

**Electro-Positive Ions.**—The cations or groups of atoms or radicals which appear at the cathode of a decomposition cell.

**Electro-Positively.**—In an electro-positive manner.

**Electro-Positives.**—(1) The cations or electro-positive ions of radicals. (2) The atoms or radicals that appear during electrolysis at the cathode, or negative electrode.

**Electro-Positive Radicals.**—The electro-positive ions.

**Electro-Potential Energy.**—Electric energy possessing the power of doing work, but not actually doing work.

**Electro-Prognosis.**—In electro-therapeutics a prognosis, or prediction of the fatal or non-fatal termination of a disease, from an electro-diagnosis based on the exaggerated or diminished reactions of the excitable tissues of the body, when subjected to the varying influences of electric currents.

**Electro-Puncturation.**—Electro-puncture.

**Electro-Puncture.**—The application of electrolysis to the treatment of aneurisms or diseased growths.

**Electro-Pyrometer.**—An apparatus for the determination of temperature by the measurement of the electric resistance of a platinum wire exposed to the temperature which is to be measured.

**Electro-Receptive Devices.**—(1) Various devices suitable for being placed in an electric circuit and energized by the passage of an electric current through them. (2) Translating devices.

**Electro-Reciprocating Drill.**—An electro-percussion drill.

**Electro-Refining.**—Various processes for the electric refining of metals.

**Electro-Skiagraph.**—A term proposed for a radiograph or X-ray picture.

**Electro-Semaphore.**—A semaphore operated by means of electricity.

**Electro-Sensibility.**—An effect produced on a sensory nerve by its electrization.

**Electro-Siliceous Light.**—An effect obtained by the discharge of a powerful rheostatic machine, through a glass tube traversed by a platinum wire, and plunged in salt water, the heat of the discharge not only melting and volatilizing the wire, but also raising the glass tube to brilliant incandescence.

**Electro-Silvering.**—Covering a surface with an adherent coating of silver, by electro-plating.

**Electro-Smelting.**—The separation or reduction of metallic substances from their ores, by means of the heat developed by electric currents.

**Electro-Statics.**—That branch of electric science which treats of the phenomena and measurement of electric charges.

**Electro-Steeling.**—(1) The art of covering copper electrodes with a thin coating of hardened iron. (2) Covering a printing surface of an electro with a thin deposit of copper, for the purpose of hardening it.

**Electro-Stereotype.**—A word sometimes employed for electro-type.

**Electro-Stereotyping.**—Electro-typing.

**Electro-Synthesis.**—The chemical combination of electro-positive and electro-negative radicals under the influence of electricity.

**Electro-Technics.**—The science which treats of the technical applications of electricity and the general principles involved therein.

**Electro-Telegraphy.**—Electric telegraphy.

**Electro-Therapeutic Bath.**—A bath furnished with suitable electrodes for use in the therapeutic applications of electricity.

**Electro-Therapeutic Breeze.**—An electric breeze or convection current in air produced by the electrification of metallic points.

**Electro-Therapeutic Diffusion of Current.**—The difference in the density of a current in different parts of the human body between electrodes applied therapeutically.

**Electro-Therapeutic Dosage.**—Proportioning the strength of an electro-therapeutic current and the duration of its application to the body.

**Electro-Therapeutic Electrode.**—The electrode mainly concerned in the electro-

therapeutic treatment or diagnosis of diseased or disordered parts of the body.

**Electro-Therapeutic Electrodes.**—Electrodes of various shapes employed in electro-therapeutics.

**Electro-Therapeutic Galvanisation.**—In electro-therapeutics, the effects produced on nervous or muscular tissue by the passage of a voltaic current.

**Electro-Therapeutic Head-Breeze.**—A form of electric breeze or convective electric discharge applied to the head.

**Electro-Therapeutic Polarizing-Current.**—The current which produces the phenomena of electro-tonus.

**Electro-Therapeutic Electrician.**—An electro-therapist.

**Electro-Therapeutics.**—(1) The application of electricity to the human body for the curing of disease or the improvement of health. (2) Electro-therapy.

**Electro-Therapeutist.**—An electro-therapist.

**Electro-Therapist.**—(1) One skilled in electro-therapy. (2) An electro-medical practitioner.

**Electro-Therapy.**—A word sometimes used instead of electro-therapeutics.

**Electro-Thermal Meter.**—An electric meter in which the current is measured by means of the heat generated by the passage of the current through a resistance.

**Electro-Thermancy.**—That branch of electricity which treats of the effects produced by an electric current on the temperature of a thermo-electric junction.

**Electro-Thermic.**—Of or pertaining to the generation of heat by means of electricity.

**Electro-Thermic Lightning-Arrester.**—A lightning arrester operated by the expansion of a high-resistance shunt wire permanently connected to the circuit.

**Electro-Thermotic.**—Of or pertaining to heat generated by electricity.

**Electro-Tinning.**—Covering a substance with a coating of tin by electro-plating.

**Electro-Tint.**—An etching obtained by electricity.

**Electro-Tinting.**—A term proposed for a method of electric engraving.

**Electro-Type.**—To produce a fac-simile by electrolytically depositing metals in a mould.

**Electro-Type.**—A cast or impression of type obtained by means of electro-metalurgy.

**Electro-Type Process.**—The process of electro-typing.

**Electro-Typic.**—Of or pertaining to electro-typing.

**Electro-Typing.**—Obtaining casts or copies of pages of type by depositing metals in moulds, by the agency of electric currents.

**Electro-Typographic.**—Pertaining to printing by means of electricity.

**Electro-Typy.**—The art of producing electro-types.

**Electro-Vection.**—A term sometimes employed for electric endosmosis.

**Electro-Vital.**—Pertaining to the relations between electricity and vitality.

**Electrocesis.**—A word proposed for curing disease by electricity. (Not med.)

**Electro Compound-Magnet.**—A term formerly applied to an electro-magnet whose core was wound with two separate wires or conductors. (Obsolete.)

**Electro Contact-Mine.**—A submarine mine that is automatically fired on the completion of the current of a battery placed on shore, on the closing of floating contact points by passing vessels.

**Electrocution.**—Capital punishment by means of electricity.

**Electrode.**—(1) Either of the terminals of an electric source. (2) Either of the terminals of an electric source that are placed in a solution in which electrolysis is taking place. (3) Either of the electro-therapeutic terminals of an electric source.

**Electrodes.**—The positive and negative terminals of an electric source, at their points of application to a receptive device.

**Electrodeless Discharge.**—The discharge obtained through the rarified gas of any vacuum tube that is unprovided with electrodes.

**Electrogen.**—A name sometimes applied to the unknown cause of electricity. (Not in general use.)

**Electrograph.**—(1) A curve produced by a recording electrometer. (2) A word sometimes used for radiograph.

**Electrographics.**—(1) The science of geometrically solving electrical problems by graphical methods. (2) The science which treats of the graphical representation of electric quantities.

**Electrolier.**—A chandelier for holding electric lamps, as distinguished from a chandelier for holding gas burners.

**Electrolier Arm.**—An electric fixture employed for attaching incandescent electric lamps to gas fixtures or electroliers.

**Electrolier Cut-Out.**—Any cut-out connected in the circuit of an electrolier.

**Electrolier Switch.**—A switch conveniently located for lighting or extinguishing lamps in an electrolier.

**Electrisation.**—The act of being electrified, or electrifying.

**Electrologist.**—An unnecessary word proposed for electrician.

**Electrologist.**—One skilled in the science of electricity. (Not in general use.)

**Electrology.**—That branch of science which treats of electricity. (Obsolete.)

**Electrolysis.**—(1) Chemical decomposition effected by means of an electric current. (2) The decomposition of the molecule of an electrolyte into its ions or radicals. (3) Electrolytic decomposition.

**Electrolysis by Means of Alternating Currents.** Electrolytic decomposition effected, under certain circumstances, by alternating currents.

**Electrolysis of Salts.**—The electrolytic decomposition of a salt into its constituent ions or radicals.

**Electrolyte.**—(1) Any compound liquid which is separable into its constituent ions or radicals by the passage of electricity through it. (2) The exciting liquid in a voltaic cell.

**Electrolytic.**—Of or pertaining to electrolysis.

**Electrolytic Accumulator.**—A word sometimes applied to a secondary or storage battery.

**Electrolytic Analysis.**—A term sometimes used for electric analysis.

**Electrolytic Annunciator.**—An annunciator consisting of a number of separate electric cells, provided with a transparent cover, and so arranged that on the closing of the circuit of any particular cell by a distant push-button, a chemical decomposition is effected in the liquid of the electrolytic cell and a reddish-brown film formed over the surface of the electrode connected therewith.

**Electrolytic Assaying.**—Assaying by means of electrolysis.

**Electrolytic Bath.**—An electrolytic cell.

**Electrolytic Cell.**—(1) A cell or vessel containing an electrolyte in which elec-

trolysis is carried on. (2) A plating cell or vat.

**Electrolytic Clock.**—A timepiece in which the rotation of the clock-work is obtained by the rotation of a delicately pivoted and well balanced wheel by the difference in weight of its two halves immersed in an electrolytic bath, on the passage of an electrolyzing current.

**Electrolytic Condenser.**—A condenser consisting of a number of iron plates immersed in a solution of carbonate of soda, and inserted in a branch circuit for the purpose of giving the current in that circuit a head, by increasing the capacity.

**Electrolytic Conduction.**—A term sometimes employed to indicate the passage of electricity through an electrolyte by means of charges imparted to its free ions or radicals.

**Electrolytic Conductivity.**—The reciprocal of the electrolytic resistance.

**Electrolytic Convection.**—A term proposed for explaining the apparent conduction of electricity by an electrolyte, without decomposition.

**Electrolytic Corrosion.**—The corrosion by electrolytic action of water-pipes, gas-pipes, or other masses of metal, buried in moist earth.

**Electrolytic Coulomb-Meter.**—A coulomb-meter whose operation depends on electrolytic decomposition.

**Electrolytic Diaphragm.**—A diaphragm in an electro-plating bath.

**Electrolytic Decomposition.**—The separation of a molecule into its constituent ions or radicals by the action of an electric current.

**Electrolytic Dissociation.**—Electrolytic decomposition.

**Electrolytic Epilation.**—The removal of hair by electrolysis.

**Electrolytic Etching.**—(1) Etching by means of electrolytic corrosion. (2) A form of electric etching.

**Electrolytic Exchange.**—Electrolysis.

**Electrolytic Generator.**—A continuous-current dynamo-electric generator designed for supplying electricity for electrolytic purposes.

**Electrolytic Heating.**—A method of electric heating consisting in plunging the metal to be heated beneath the surface of a conducting liquid, while held in a metal clamp that is connected to the negative pole of a continuous-current source, while the positive pole of such source is connected to the metal lining of the vessel containing the conducting liquid.



**Electrolytic Hydrogen.**—Electrolytically liberated hydrogen.

**Electrolytic Meter.**—An electro-chemical meter.

**Electrolytic Moulding.**—A term sometimes employed for electro-typing.

**Electrolytic Refining.**—The refining of metals by electrolysis.

**Electrolytic Removal of Hair.**—Electrolytic epilation.

**Electrolytic Separation.**—Molecular dissociation produced by electrolysis.

**Electrolytic Synthesis.**—Synthesis of a substance by electrolytic means.

**Electrolytic Writing.**—Imprinting written characters on cloths or other textile fabrics by the electrolytic decomposition of a dyeing substance with which they are impregnated.

**Electrolytically.**—In an electrolytic manner.

**Electrolyzability.**—Possessing the power of being electrolyzed.

**Electrolyzable.**—Capable of being electrolyzed or decomposed by means of electricity.

**Electrolyzation.**—The act of electrolyzing.

**Electrolyze.**—To separate or decompose by means of electricity.

**Electrolyzed.**—Separated or decomposed by means of electricity.

**Electrolyzer.**—(1) One who, or that which, causes electrolysis. (2) An electrolyzing apparatus.

**Electrolyzing.**—Causing or producing electrolysis.

**Electrolyzing Cell.**—An electrolytic cell.

**Electrolyzing Chamber.**—A chamber or space in which electrolysis occurs.

**Electrometer.**—An apparatus for measuring differences of electric potential.

**Electrometer Fatigue.**—The failure of the needle of an electrometer to return to the zero point, due to the elastic fatigue of its suspension.

**Electrometer Gauge.**—A device employed in connection with some heterostatic electrometers, to ascertain whether the needle connected with the layer of acid, that acts as the inner coating of a Leyden-jar used in connection therewith, is at its normal potential.

**Electromotor-Voltmeter.**—A voltmeter in which the differences of potential to be measured are employed to charge insulated conductors, the electrostatic attractions and repulsions of which result

in the deflection of a suitably suspended metallic needle.

**Electrometric.**—Of or pertaining to an electrometer.

**Electrometrical.**—(1) Of or pertaining to the measuring of electrical forces. (2) Of or pertaining to an electrometer.

**Electromotive Arrangement or Device.**—An electromotive source.

**Electromotive Force.**—(1) The force which starts or tends to start electricity in motion. (2) The maximum or total generated difference of potential which exists in a circuit.

**Electromotive Force of Induction.**—The electromotive force developed by any inductive action.

**Electromotive Impulse.**—An impulse producing an impulsive rush of electricity.

**Electromotive Intensity.**—The vector electric force at a point, as measurable by the mechanical force that would be exerted upon a unit electric charge at that point.

**Electromotive Series.**—A name sometimes given to a contact series.

**Electromotive Source.**—Any source such as a dynamo, or voltaic cell, capable of producing an electromotive force.

**Electromotograph.**—An apparatus in which the friction of a platinum point against a rotating cylinder of chalk is reduced by electrolytic action, consequent on the passage of an electric current.

**Electromotographic Telephone.**—A loud-speaking telephone operating on the principle of the electromotograph.

**Electron.**—(1) A word formerly used for amber. (2) The electric atoms whose projection from the cathode of a high-vacuum tube is supposed to constitute the cathode rays or streamings. (3) An alloy of gold and silver.

**Electronocrosis.**—Pertaining to capital punishment by means of electricity.

**Electronecrosis.**—A word proposed for capital punishment by means of electricity. (Not in use.)

**Electronome.**—A name proposed for a measurer of electricity. (Not in use.)

**Electropath.**—One skilled in the art of electro-therapy.

**Electropathy.**—A word sometimes employed for electro-therapeutics.

**Electrophanic.**—Pertaining to capital punishment by means of electricity.



- Electrophanical.**—Pertaining to capital punishment by means of electricity.
- Electrophanize.**—To inflict capital punishment by means of electricity.
- Electrophany.**—A word proposed for capital punishment by means of electricity. (Not in use.)
- Electrophila.**—A word proposed for capital punishment by means of electricity. (Not in use.)
- Electrophobia.**—A word proposed for unnecessary fear of electricity.
- Electrophone.**—A word proposed for a carbon-contact telephone transmitter.
- Electrophor.**—An orthography sometimes employed for electrophorous.
- Electrophoric.**—Of or pertaining to an electrophorous.
- Electrophoric Medium.**—A word sometimes employed for a dielectric medium.
- Electrophorous.**—A simple form of electrostatic induction apparatus.
- Electropoion Liquid.**—An exciting liquid, consisting of one part of bichromate of potash dissolved in ten parts of water, to which two and a half parts of sulphuric acid have been gradually added.
- Electroscope.**—An apparatus for showing the presence of an electric charge, or determining its character, whether positive or negative, but not for measuring its amount or value.
- Electroscopic Gauge.**—A term formerly applied to an early form of discharging gold-leaf electroscope.
- Electroscopically.**—By means of an electroscope.
- Electroscopy.**—The art of determining, by means of an electroscope, the character of an electric charge.
- Electrostatic.**—Of or pertaining to electrostatics.
- Electrostatic Attraction.**—The mutual attraction existing between unlike electric charges.
- Electrostatic Aurora.**—Luminous phenomena attending the production of an electrostatic corona.
- Electrostatic Balance.**—A form of balance employed for the measurement of high, direct, or alternating electromotive forces, by the electrostatic effects produced by their charges.
- Electrostatic Capacity.**—The quantity of electricity which must be imparted to a given conductor as a charge, in order to raise its potential to unity, all neighboring conductors being at zero potential.
- Electrostatic Capacity of a Line.**—The power possessed by an electric line wire or conductor to act as a condenser. (2) The capacity of a line or conductor for holding an electric charge, as a condenser.
- Electrostatic Charge-Current of Cable.**—A momentary and violent rush of current that occurs on the application of an electromotive force to a submarine cable.
- Electrostatic Circuit.**—A circuit formed by lines of electrostatic flux with an electric source.
- Electrostatic Corona.**—A luminous effect produced on the surface of a thin sheet of mica, or other insulating material, when placed between two electrodes, subjected to a comparatively high difference of potential.
- Electrostatic Current.**—The time-rate-of-flow of electrostatic flux.
- Electrostatic Difference of Potential.**—The difference of potential due to electric charges.
- Electrostatic Discharge.**—A term sometimes employed for a disruptive discharge.
- Electrostatic Field.**—(1) The region of electrostatic influence surrounding a charged body. (2) A region traversed by electrostatic flux.
- Electrostatic Flux.**—A stress in the ether which proceeds from a charged body along definite curved lines or paths.
- Electrostatic Flux-Paths.**—The paths traversed by electrostatic flux.
- Electrostatic Force.**—The force which produces the attractions or repulsions of charged bodies.
- Electrostatic Generator.**—A general term applied to various forms of influence machines.
- Electrostatic Hysteresis.**—(1) The energy consumed in an alternating-electrostatic field by the dielectric medium. (2) Dielectric hysteresis.
- Electrostatic Indicator.**—A name sometimes applied to an electrometer.
- Electrostatic Induction.**—The induction of an electric charge produced in a conductor brought into an electrostatic field.
- Electrostatic Induction-Machine.**—(1) A machine in which a small initial charge produces a greatly increased charge by its inductive action on a rapidly rotated disc of glass or other dielectric. (2) An electrostatic influence machine.
- Electrostatic Influence.**—A term sometimes used instead of electrostatic induction.

**Electrostatic Leakage.**—The gradual dissipation of a charge due to insufficient insulation.

**Electrostatic Lines of Force.**—(1) Lines of force produced in the neighborhood of a charged body, by the presence of the charge. (2) Lines extending in the direction in which the force of electrostatic attraction or repulsion acts.

**Electrostatic Motion.**—Motion produced by an electrostatic field somewhat similar to motion produced by a magnetic field.

**Electrostatic Motor.**—(1) A motor driven by means of the induction of two varying electrostatic fields at right angles to each other. (2) Generally, a motor driven by the interaction of two or more electrostatic fields.

**Electrostatic Optical Strain.**—A strain or deformation produced in an optical medium by the stress of an electrostatic field.

**Electrostatic Potential.**—(1) The power of doing electric work possessed by a unit quantity of positive electricity residing on the surface of an insulated body. (2) That property in space by virtue of which work is done when an electric charge is moved therein.

**Electrostatic Repulsion.**—The mutual repulsion produced by two similar electrostatic charges.

**Electrostatic Resistance.**—The resistance offered by any medium to the passage of an electrostatic flux or an electrostatic current.

**Electrostatic Retardation.**—Retardation in signalling, on long telegraphic lines, due to electrostatic capacity.

**Electrostatic Screening.**—Screening or shielding from the inductive effects of an electrostatic charge.

**Electrostatic Strain.**—Strain produced by the stress of an electrostatic field.

**Electrostatic Stress.**—The force or pressure in an electrostatic field which produces electrostatic strain in any substance placed therein.

**Electrostatic Time, Constant.**—In an electric circuit or condenser possessing capacity and resistance, the product of the capacity and the resistance, usually expressed in seconds or farad-ohms.

**Electrostatic Units.**—Units based on the attractions or repulsions of two unit charges of electricity at unit distance apart.

**Electrothanasizing.**—Producing accidental death by means of electricity.

**Electrothanasias.**—A word proposed for accidental death produced by electricity. (Not in use.)

**Electrothanasise.**—To produce accidental death by electricity.

**Electrothanasiose.**—A word proposed for capital punishment inflicted by means of electricity. (Not in use.)

**Electrothanasiosic.**—Of or pertaining to capital punishment by means of electricity.

**Electrothanasosing.**—A word proposed for execution by electricity.

**Electrotiasis.**—A word proposed for capital punishment by means of electricity. (Not in use.)

**Electrotome.**—A term sometimes applied to an automatic contact-breaker which vibrates with sufficient rapidity to produce a musical sound.

**Electrotonic.**—Of or pertaining to electrotonus.

**Electrotonic Currents.**—In electro-therapeutics, a current due to the internal polarization of a nerve fibre between the conducting core of the nerve and its enclosing sheath.

**Electrotonic Effect.**—An altered condition of excitability produced in a nerve when in the electrotonic state.

**Electrotonic Excitability.**—The actual excitability of a nerve when in the electrotonic state.

**Electro-Tonicity.**—A term sometimes employed for electrotonus.

**Electrotonus.**—The condition of altered functional activity which occurs in a nerve when subjected to the action of an electric current.

**Electrozemia.**—A word proposed for capital punishment by means of electricity. (Not in use.)

**Electrum.**—A name given by the ancients to various substances that could be readily electrified by friction.

**Element.**—(1) Any kind of matter which cannot be decomposed into simpler matter. (2) Matter that is formed or composed of but one kind of atoms.

**Element of Current.**—A term employed in mathematical discussions to indicate a very small part of a current, for ease in considering its actions.

**Element of Storage Battery.**—(1) A single set of positive and negative plates of a storage cell, so connected as to be ready for placing in the acid liquid of the containing jar or vessel. (2) A term some-

times applied to one of the storage cells of a battery.

**Element of Voltaic Cell.**—Either of the substances forming the couple of a voltaic cell.

**Elements of Armature Winding.**—The separated conductors forming the parts of an armature winding.

**Elementary Matter.**—Matter which cannot be decomposed into simpler matter.

**Elevator Annunciator.** An annunciator connected with an elevator to indicate the floor from which a signal is sent.

**Elevator, Electric.**—An elevator operated by means of an electric motor.

**Elevator Switch.**—A switch operated from an elevator for controlling the operation of the elevator motor.

**Elliptical Rotary-Magnetization.**—The magnetization which exists in a diphas motor when two alternating-magnetic fluxes coexist while out of phase with each other.

**Elliptical Rotation.**—A rotation as of a point on an ellipse.

**Elliptically Rotating Magnetic Field.** (1) A magnetic field which is subject to elliptical rotation. (2) The rotation of magnetic flux produced by two diphas currents of unequal intensity, or of equal intensity, but not of 90° phase difference.

**Elongated Ring-Core.** A hollow cylindrical core of comparatively great length.

**Elongation of Needle.** A phrase sometimes used for the maximum angular deflection of a needle, or the maximum deflection of the spot of light on a galvanometer scale, when making one or more swings.

**Embedded Coils.**—(1) Coils or windings placed in grooves or perforations on the armature of a dynamo or motor. (2) Iron-clad armature coils.

**Embossing Telegraphic Instrument.** A registering telegraphic instrument in which the signal is recorded in embossed characters on a paper fillet.

**Emergency Brake.**—(1) A brake on a vehicle employed only in emergency. (2) In an electrically propelled vehicle a brake of greater power than the ordinary brake, and used only in emergency, as, for example, a reversing switch to reverse the direction of rotation of the motors.

**Emergency Cable.**—A small, comparatively inexpensive and easily handled cable, employed in the case of breaks in a pole line due to floods, railroad wrecks,

etc., for opening up communication during repairs of the break.

**Emergency Crew.**—A crew or gang in a power distribution system for service in case of a break-down, emergency, or fault on the line.

**Emergency Switch.**—An accessory switch placed on a car controller for reversing the motion of a car when necessary.

**Electrotic.**—Pertaining to capital punishment by means of electricity.

**Electrotizing.**—Inflicting capital punishment by means of electricity.

**Emissivity.**—The specific radiating power of a surface, or its ability to emit or throw out radiant energy, usually expressed in ergs per sq. cm.

**Emissivity of Filament.**—The ability of a filament to emit or radiate light and heat when traversed by an electric current.

**Emmetropic Eye.**—The normal human eye, or the human eye in its normal adjustment and capability of accommodation.

**Empanelled Wires.**—Wires placed inside mouldings, or behind panels.

**Emptiod.**—A term sometimes applied to a discharged secondary or storage battery, or to a discharged condenser.

**Enamelled Rheostat.**—A rheostat whose coils consist of wires imbedded in a mass of enamel, in close juxtaposition to a mass of iron or other heat-conducting material.

**Enclosed Arc-Lamp.**—An arc-lamp whose carbons are enclosed by a closely fitting globe, so as to maintain an atmosphere around the arc practically devoid of oxygen, thus diminishing the rate of consumption of the carbons.

**Enclosure of Magnetic Flux.**—(1) Linkage of magnetic flux. (2) Confining magnetic flux in a ferric magnetic circuit.

**End Connections.**—End windings.

**Endlessness.**—The condition of a closed ring of uniform cross-section in which the magnetizing coils are wound uniformly all around it, and a practically endless or uniform magnetic field is obtained throughout the length of the ring.

**Endoscopic Lamp.**—A lamp provided for the examination of a bodily cavity through its natural outlet.

**Endosmometer.**—An apparatus for measuring the strength of endosmotic currents.

**Endosmosis.**—The unequal mixing of two different liquids or gases through the pores of an interposed medium.



**Endosmose, Electric.**—(1) The unequal mixing of two liquids through the pores of an interposed septum on the passage of an electric current through the septum. (2) The transfer of liquid through an immersed septum traversed by an electric current.

**Endosmosis.**—A word frequently employed in place of endosmose.

**Endosmotic Equivalent.**—The ratio between the amount of water that passes through a porous membrane into a saline solution, and the amount of salt that passes in the opposite direction.

**Endothactio Cut-out.**—A cut-out arranged to throw a device into a circuit.

**Endothactio Switch.**—A switch which is arranged to cut a device into a circuit.

**Endothermic.**—Of or pertaining to the absorption of heat.

**Endothermic Reaction.**—A chemical action attended with the absorption of heat.

**End-to-End Joint.**—A term frequently employed in place of butt-joint.

**End Windings.**—(1) End connections. (2) Conductors for connecting up bar windings at the end of an armature.

**Energetics.**—That branch of mechanics which treats of the transfer of energy or of its transformation.

**Energy.**—The power of doing work.

**Energy Component of Current.**—(1) In an alternating-current circuit the component of current which is in phase with the impressed E. M. F. (2) In an alternating-current circuit, the product of the E. M. F. and the effective conductance.

**Energy Component of E. M. F.**—(1) In an alternating-current circuit the component of E. M. F. which is in phase with the current. (2) In an alternating-current circuit, the product of the current and the effective resistance.

**Energy Current.**—(1) A term sometimes used for active component of current in an alternating-current circuit, as distinguished from the wattless component of current. (2) The product in an alternating-current circuit of the effective conductance and the E. M. F.

**Energy Efficiency of Storage Battery.**—The watt-hour efficiency.

**Energy, Electric.**—The power which electricity possesses of doing work.

**Energy Electromotive Force.**—(1) The energy component of E. M. F. in an alternating-current circuit. (2) The component of E. M. F. which is in phase with the current strength.

**Energy Flux.**—(1) A stream of energy transfer. (2) A surface integral of energy transferred through a surface.

**Energy Meter.**—A term sometimes applied to a wattmeter.

**Energy of Motion.**—A word sometimes used for kinetic energy.

**Energy of Position.**—A word sometimes used for potential energy.

**Energy of Strain.**—A term sometimes used for potential energy of deformation elasticity.

**Energy Resistance.**—In an alternating-current circuit, the energy component of impedance.

**Energy Storage-Capacity.**—The total amount of energy which a storage cell can store up expressed in watt-hours.

**Energy Transforming-Device.**—A device which will transform or change energy from one form to another.

**Engaged Test.**—(1) In telephony, the busy test. (2) A test made by the operator at a central exchange to ascertain whether the subscriber desired is already engaged in telephonic communication.

**Engine.**—In telephony, a name sometimes used for a ringer or magneto-generator.

**Engine Dynamo.**—A direct-connected dynamo.

**Engine Plane Signal.**—In a system of mine signalling a current containing a battery and bell at the engine house, and a pair of uncovered iron wires along the engine plane, or hoist run, for the purpose of giving signals to the man at the engine.

**Engine-Room Indicator.**—An indicator placed in an engine-room.

**Engine-Room Tachometer.**—A tachometer suitable for permanent attachment to an engine, dynamo, or other rotating machine situated in an engine-room.

**Engine Telegraph.**—A telegraph on board ship for communicating orders to the engine-room.

**English Heat Unit.**—(1) The British heat unit. (2) The heat necessary to raise a pound of water 1° F.

**Engraving, Electric.**—A method for electrically etching or engraving a metallic plate by covering it with wax, tracing the design on the wax so as to expose the metal, connecting the metal with the positive terminal of a battery, and placing it in a bath opposite another plate of metal, so that it will be electrically corroded on its exposed parts.

**Entering Current of Telegraphic Circuit.**—A term employed to designate the



current on a telegraphic line or conductor near the battery.

**Entrefer.**—(1) The gap of non-magnetic material through which the field flux has to pass at the surface of the armature of a dynamo-electric machine, composed either of an air gap or of air and copper. (2) The width of the non-magnetic gap, as distinguished from the width of the clearance or simple air-gap of a smooth cored armature.

**Entropy.**—(1) In thermo-dynamics the non-available energy in any system. (Thomson and Mayer.) (2) In thermo-dynamics the available energy in any system. (Thomson, Maxwell.)

**Entropy, Electric.**—A term proposed by Maxwell for use in thermo-electric phenomena, to include the doctrine of entropy in electric science.

**Environment.**—The accompaniments or surroundings of any thing or condition.

**Eolotropic.**—(1) Heterogeneous with respect to direction. (2) A medium in which equal stresses applied in different directions do not produce equal and similar strains.

**Eolotropic Dielectric.**—A dielectric possessing eolotropic properties.

**Eolotropic Medium.**—Any medium possessing eolotropic properties.

**Eolotropic Wire-Grating.**—An eolotropic screen employed by Hertz in his experiments on electric radiation.

**Eolotropism.**—The possession of eolotropic properties.

**Eolotropy.**—The doctrine, theory, or condition of eolotropism.

**Epoch.**—In the case of a vibrating body, the time or the angle reckoned from the point of starting to the point of maximum positive elongation.

**Equal Arms Electric Balance.**—An electric Wheatstone bridge or balance employing equal arms.

**Equal Deflection Method.**—A method of measuring a resistance, electromotive force or current which consists in obtaining the same deflection on a galvanometer in the circuit with a given shunt.

**Equalizer.**—(1) An equalizing bar. (2) A term employed for an equalizer wire. (3) A device for equalizing electric pressure over a system.

**Equalizer Feeder.**—A feeder whose sole or principal purpose is to equalize the pressure between the ends of two or more other feeders, as distinguished from supplying current to feeding points.

**Equalizer Feeder-Switch.**—A switch employed to throw a feeder equalizer in or out of circuit.

**Equalizer Switch.**—A switch governing a resistance suitable for feeder regulation.

**Equalizer Wire.**—(1) An equalizing bar. (2) A wire connecting the series windings of two or more compound-wound generators operated in parallel.

**Equalizing Bar.**—A bar joining the series coils of two parallel-connected, compound-wound generators, so that any excess of current supplied by the armature of one machine must necessarily excite the other machine to the same extent.

**Equalizing Current.**—The current passing through an equalizing bar between two dynamos.

**Equalizing Dynamo.**—A dynamo employed in systems of three or five-wire distribution to supply one pair of mains which may be unduly loaded so as to equalize the pressure.

**Equalizing Resistance-Coils.**—Resistance coils employed in a system of feeder regulation.

**Equalizing Wires.**—(1) Two wires or conductors, one of which is employed for connecting the positive brushes and the other for connecting the negative brushes of compound-wound dynamos, when connected in parallel. (2) Wires connecting corresponding segments in a multipolar armature winding.

**Equator of Magnet.**—(1) A point approximately midway between the poles of a straight bar magnet, or nearly midway from the poles of a horse-shoe magnet, if measured along the bar from each pole. (2) A line of neutral points on a magnet.

**Equatorial.**—Of or pertaining to the equator.

**Equatorial Region of Magnet.**—The portions of a magnet which lie near the magnetic equator.

**Equatorially.**—In the direction of the equator.

**Equiangular Impedances.**—Impedances which have the same angle.

**Equilibrium.**—The condition of a body on which several forces are acting, so that their resultant is zero.

**Equilibrium of Radiation.**—The condition of a radiating body in which the radiant energy it absorbs is equal to that which it emits.

**Equimolecular Solutions.**—Solutions which contain, in the same quantity of

the solvent, quantities of the dissolved substance proportional to their molecular weights.

**Equipotential.**—Of or pertaining to an equality of potential.

**Equipotential Electrostatic Surfaces.**

(1) Surfaces on or surrounding charged bodies, all points of which are at the same electric potential. (2) Electric surfaces perpendicular to the lines of electric force, over which a quantity of electricity, considered as being concentrated at a point, may be moved without doing work.

**Equipotential Magnetic Surfaces.**—

Surfaces surrounding the poles of a magnet or system of magnets, where the magnetic potential is the same.

**Equivalent Air-Gap.**—An air-gap which would have the same magnetic resistance as a joint, assuming the permeability of the metal to be unaffected by the cutting.

**Equivalent Conductance.**—(1) A conductance such that if inserted in a sinusoidal-current circuit would absorb energy at the same rate as the actual conductance in a non-sinusoidal current circuit. (2) Virtual conductance. (3) The effective conductance of an alternating-current system or conductor.

**Equivalent Conductivity.**—The molecular conductivity of a solution divided by the valency.

**Equivalent Impedance.**—Such an impedance in a simple-harmonic-current circuit as would, with the same effective current strength, absorb energy at the same rate as an actual impedance in a complex-harmonic-current circuit.

**Equivalent Reactance.**—Such a reactance in a simple-harmonic-current circuit as would permit energy to be absorbed, with the same effective current strength, at the same rate as an actual reactance in a complex-harmonic-current circuit.

**Equivalent Resistance.**—(1) A single resistance which may replace a number of resistances in a circuit without altering the current traversing it. (2) Such a resistance in a simple-harmonic-current circuit as would permit energy to be absorbed, with the same effective current strength, at the same rate as an actual resistance in a complex-harmonic-current circuit. (3) The effective resistance of an alternating-current system or conductor.

**Equivalent Resistance and Inductance.**—In an alternating current circuit, or system of circuits, such a resistance and inductance as would, if substituted for the actual system, cause the same

strength and activity of current to pass through the conducting leads.

**Equivalent Resistance and Reactance.**

Such a resistance and reactance in a simple alternating-current circuit, as would cause the same current both in magnitude and phase to flow in the main leads, as when a number of multiple arc circuits are connected to them.

**Equivalent Sinusoid.**—A curve representing a sinusoid, which, for purposes of analytical investigation, has been taken as the equivalent in power of a curve of pressure or current which is not sinusoidal.

**Equivolt.**—A term proposed for unit of electric energy applied especially to chemical decomposition. (Not in general use.)

**Erb's Standard Size of Electrodes.**—Standard sizes of electrodes, generally adopted in electro-therapeutics.

**Erg.**—(1) The C. G. S. unit of work, or the work done when unit C. G. S. force is overcome through unit C. G. S. distance. (2) The work accomplished when a body is moved through a distance of one centimetre with the force of one dyne. (3) A dyne-centimetre.

**Erg-Meter.**—(1) An apparatus for measuring the work of an electric current in ergs. (2) An energy-meter.

**Ergometer.**—An erg-meter.

**Erg : s.**—An abbreviation proposed for erg-per-second, the C. G. S. unit of power.

**Erg-Ton.**—(1) A term proposed for ten million ergs;  $10^{10}$  ergs, or one erg multiplied by  $10^7$ . (2) A kilo-joule.

**Error.**—In telegraphy, a blunder or inaccuracy either of transmitted signals, as in sending a message, or of deciphered, re-transmitted, or recorded signals, as in receiving a message.

**Escape, Electric.**—(1) A partial loss of current to earth by imperfect insulation. (2) A loss of charge on an insulated conductor.

**Escapement, Electric.**—An electrically actuated clock escapement.

**Essential Resistance.**—A term sometimes used for internal resistance.

**Etching, Electric.**—A term sometimes used for electric engraving.

**Ether.**—The highly tenuous, elastic fluid that is assumed to fill all space, and by whose vibrations or waves light, radiant heat, and electro-magnetic radiation are transmitted.

**Ether Flow Vortices.**—Vortices in the ether upon whose alleged existence is based a hypothesis for the explanation of magnetic phenomena.

**Ether Path of Reluctivity.**—A conception employed in studying the reluctivity of a magnetic medium which regards the magnetic flux as taking two multiple-connected paths, one the path of metallic-reluctivity through the mass of the substance, and the other the path of ether-reluctivity, through its associated ether.

**Ether Streamings.**—Streamings that are assumed to exist in the ether around a magnet, or around a charged conductor.

**Ethereal.**—Of or pertaining to the ether.

**Eudiometer.**—(1) A voltmeter in which separate graduated vessels are prepared for the reception and measurement of the gaseous products evolved during electrolysis. (2) A graduated glass tube for holding and measuring the volume of the evolved gas.

**Eudiometric.**—Of or pertaining to an eudiometer.

**Eudiometrically.**—By means of an eudiometer.

**Evanescient Telegraphic Signal.**—Any telegraphic signal which is not permanently recorded.

**Evaporation.**—The change from the liquid to the vaporous state.

**Evaporation, Electric.**—The formation of vapors on the surfaces of solid or liquid substances by the influence of negative electrification.

**Even Harmonics.**—In a complex harmonically-varying quantity, the harmonics whose frequencies are even multiples of the fundamental frequency.

**Ewing's Theory of Magnetism.**—A theory of magnetism proposed by Ewing, based on the assumption of originally magnetized particles.

**Excitability of Nerve or Muscular Fibre, Electric.**—The effect produced by an electric current in stimulating a nerve of a living animal, or in producing an involuntary contraction of a muscle.

**Excitant.**—(1) That which excites. (2) The electric or magnetic force which energizes a receptive device.

**Excitation.**—(1) The production of electrification by any means. (2) The production of magnetism by any means. (3) The energizing of any electro or magneto-receptive device. (4) The production of the magnetic field in a dynamo

or motor. (3) The stimulation of a muscle or nerve fibre.

**Exerter.**—Anything which causes an excitation.

**Exerter Dynamo.**—A dynamo used for the separate excitation of another dynamo.

**Exciter of Field.**—A dynamo, or other electric source, employed in the separate excitation of the field of a dynamo.

**Exciting Ampere-Turns.**—The ampere-turns in the field-winding of a generator or motor employed for the excitation of its field.

**Exciting Fluid or Liquid of Voltaic Cell.**—The electrolyte of a voltaic cell.

**Execution, Electric.**—Inflicting capital punishment by electricity.

**Exhaust Fan, Electric.**—An electrically driven exhaust fan.

**Exhaust Wheel, Electric.**—An electrically driven rotary device for drawing or exhausting the air from an apartment.

**Exhausted Storage Cell.**—An emptied storage cell.

**Exhausted Voltaic Cell.**—A voltaic cell in a state of exhaustion.

**Exhaustion, Electric.**—Physiological effects resembling those produced by sunstroke, resulting from prolonged exposure to powerful voltaic arcs.

**Exhaustion of Primary Voltaic Cell.**—The inability of a primary voltaic cell to furnish any further current, unless fresh electrolyte, or new positive elements, or both, are supplied to it.

**Exhaustion of Secondary Voltaic Cell.**—The inability of the cell to furnish any further current until again acted on by a charging current.

**Exosmosis.**—The osmotic current which is directed towards the lower level.

**Exothactic Cut-Out.**—A cut-out designed to remove a device from a circuit.

**Exothatic Switch.**—A switch designed to cut a device out of circuit.

**Exothermic.**—Of or pertaining to an exothermic reaction.

**Exothermic Reaction.**—A chemical reaction attended by the evolution of heat.

**Expanding Magnetic Whirls.**—Magnetic whirls sent out from a conductor through which a current of gradually increasing strength is passing, or from a magnet whose magnetism is gradually increasing.

**Expanding of Magnetic Field.**—The increase in the strength of a magnetic flux and of the region traversed by it.



**Expansibility.**—(1) The quality of being expandable. (2) Possessing the capacity for expansion.

**Expansion.**—The act of increasing in length, surface, or volume.

**Expansion, Electric.**—The increase in volume produced in a body by giving it an electric charge.

**Expansion Joint.**—A joint suitable for tubes or pipes exposed to considerable changes of temperature, in which a sliding joint is provided to safely permit a change in length on expansion or contraction.

**Expanded Energy.**—The energy employed to produce any result.

**Exploder, Electric.**—A small magneto-electric machine used to produce a high electromotive force, employed in the direct firing of blasts.

**Exploration of Magnetic Field.**—Mapping out the location and density of a magnetic field by any suitable means.

**Explorer, Electric.**—An apparatus operated by means of induced currents for the purpose of locating bullets and other foreign metallic substances in the human body.

**Exploring Needle.**—(1) A form of exploring probe. (2) A magnetic needle employed in exploring a magnetic field.

**Explosive Distance.**—A term sometimes employed for sparking distance.

**Extension Bell.**—(1) An extension call-bell. (2) A call-bell situated at a distance from the apparatus to which it calls attention.

**Extension Call-Bell.**—An additional bell connected with the call-bell of a telephone or other device, and placed in some other portion of a building, for the purpose of calling the subscriber to the instrument when he may be in a distant part of the house.

**Extension Plates for Poles.**—Double plates forming between them a loop for an upper extension or branch of a guy-rod supporting a pole.

**Extension Push-Button.**—An auxiliary push-button placed at a distance from a main push-button.

**Extensometer.**—A form of apparatus for measuring the elongation of a substance under stress.

**External Armature Generator.**—A generator in which the armature is external to the field frame.

**External Characteristic of Dynamo.**—A curve showing the E. M. F. at the terminals of a dynamo under varying currents, as distinguished from an internal characteristic showing the internal E. M. F.

**External Circuit.**—That part of a circuit with which an electric source is connected that is external to that electric source.

**External Magnetic Circuit.**—(1) That portion of a magnetic circuit which lies outside the magnetic source. (2) That portion of the circuit of a magnet which lies outside its mass or core.

**External Magnetic Field.**—That portion of a magnetic field which lies outside the body of a magnet.

**External-Secondary Resistance.**—In the secondary circuit of a transformer, the resistance external to the transformer.

**Extra-Current Direct.**—A term sometimes employed for the current produced in the primary of a transformer on the breaking of its circuit.

**Extra-Current Inverse.**—A term sometimes employed for the current produced in the primary current of a transformer on the making of its circuit.

**Extra-Current Neutralizer.**—A device for reducing electro-magnetic retardation which consists of a shunted condenser inserted in the main circuit.

**Extra Currents.**—Currents produced in a circuit by self-induction.

**Extra-High-Potential System.**—In the National Electric Code a potential above 3000 volts.

**Extra-High-Potential Wires.**—Wires suitable for use in extra-high-potential systems.

**Extraneous Field.**—A leakage magnetic field.

**Extraordinary Resistance.**—A term sometimes used for external resistance. (Not in use.)

**Extra-European Message.**—In Europe a message sent to or received from some point beyond the geographical limits of Europe.

**Extra-Polar.**—Lying beyond or outside the poles.

**Extra-Polar Region.**—In electro-therapeutics, the region which lies outside or beyond the therapeutic electrodes.

**Eye-Piece.**—The ocular of a telescope or microscope.



## F

**F.**—A symbol proposed for farad, the practical unit of capacity.

**F.**—A symbol proposed for force.

**F.**—A symbol for magnetomotive force. (Partly international usage.)

**f.**—A symbol proposed for force. (Partly international usage.)

**F. M.**—A contraction for field magnets.

**F. W. G.**—A contraction for French wire gauge.

**Fac-Simile Telegraph.**—A general term embracing the apparatus employed in fac-simile telegraphy.

**Fac-Simile Telegraphy.**—(1) A system whereby a fac-simile or copy of a chart, diagram, picture, or signature, is telegraphically transmitted from one station to another. (2) Pan-Telegraphy.

**Factor.**—Each of the several quantities which are multiplied together to form a product.

**Factor of Safety.**—(1) The ratio of the computed or measured strength of a structure to the maximum strength it will be called upon to exert. (2) An amount by which the breaking load or stress in any system must be divided in order to obtain the safe load or stress. (3) A multiple of the calculated strength required of a structure adopted to ensure safety.

**Factor of Safety of Demagnetization.**—The ratio of the demagnetizing force in an zero-ferric magnetic circuit corresponding to an actually existing residual flux density, to the actually existing mean demagnetizing force.

**Fahrenheit Thermometric Scale.**—The thermometric scale in which the length of the thermometer tube, between the melting point of ice and the boiling point of water, is divided into 180 equal parts or degrees.

**Fall-Back Indicator.**—A term sometimes employed for drop indicator.

**Fall of Potential.**—The drop of potential.

**Fall of Pressure.**—The drop of pressure.

**Fall of Pressure in Active Conductor.** The fall of pressure due to the passage of the current, and equal to the product of the current strength by the resistance.

**False.**—(1) Untrue. (2) Provisionally assumed.

**False Discharge of Submarine Cable.** An oscillatory discharge produced in a cable as distinguished from an aperiodic discharge.

**False Electric Current.**—A virtual electric current distribution which has no actual existence, but which is assumed in order to comply with the conditions of an electro-magnetic field.

**False Electrification.**—A virtual electrification having no real existence, but which may be assumed in order to determine a given distribution of electro-magnetic energy in a medium.

**False Magnetic Currents.**—Virtual magnetic currents having no real existence but assumed for the purpose of conforming to the requirements of a given electro-magnetic distribution.

**False Magnetic Poles of Earth.**—A term proposed to designate the place or places on the earth which apparently act as magnetic poles, in addition to two true magnetic poles in the neighborhood of the earth's geographical poles.

**False Resistance.**—A resistance arising from a counter electromotive force, and not directly from the dimensions of the circuit, or from its specific resistance.

**False Zero.**—(1) A zero of a measuring instrument accepted at the position it naturally assumes under the action of forces other than those impressed in the measurement. (2) A zero taken midway between two unequal and opposite deflections of a measuring instrument. (3) In Wheatstone-Bridge measurement, the position of the galvanometer needle naturally assumed under the influence of E. M. F. in the bridge before the application of the testing battery. (4) In cable testing the position of the spot of light when the testing battery is disconnected and the galvanometer short-circuit key is open. (5) A cable zero, or zero to the existing current in a cable. (6) The natural zero.

**Fan Guard.**—A wire guard placed around an electric fan, to prevent the revolving blades from coming in contact with surrounding objects.

**Fan Motor.**—(1) An electric motor suit-

able for driving a fan. (2) An electric motor carrying a fan.

**Far-Leading Dynamo.**—A motor-dynamo placed as a shunt across a pair of long mains, to compensate for their drop in voltage.

**Farad.**—(1) The practical unit of electric capacity. (2) Such a capacity of a conductor or condenser that one coulomb of electricity is required to produce therein a difference of potential of one volt.

**Faraday Effect.**—The rotation of the plane of polarization of a beam of plane polarized light on its passage along a magnetic field.

**Faraday's Cube.**—An insulated room or cube covered on the inside with tin-foil, which, when charged on the outside, gives no electrical indications to an observer on the inside even to delicate instruments.

**Faraday's Dark Space.**—The gap in the continuity of the luminous discharges that occur between the positive and negative electrodes.

**Faraday's Disc.**—A metallic disc movable in a magnetic field on an axis parallel to the direction of the flux.

**Faraday's Net.**—An insulated net of cotton, gauze, or other similar conducting material, capable of being turned inside out without being thereby discharged, and employed for demonstrating the fact that the charge of an insulated conductor is limited to its outer surface.

**Faradic.**—Of or pertaining to Faraday.

**Faradic Adapter.**—A device for readily permitting commercial incandescent-light circuits to be employed for electro-therapeutic work, with an induction coil.

**Faradic Battery.**—A term erroneously used for a faradic coil, or induction coil.

**Faradic Brush.**—A brush-shaped electrode employed in the medical application of electricity.

**Faradic Coil.**—A term sometimes used for a faradic machine, or medical induction coil.

**Faradic Current.**—(1) In electro-therapeutics, a current produced by an induction coil, or magneto-electric machine. (2) A rapidly alternating current, as distinguished from a direct current.

**Faradic Excitability.**—Muscular or nervous excitability produced by the employment of faradic currents.

**Faradic Excitation.**—The excitement of muscle or nerve fibre by faradic currents.

**Faradic Induction Apparatus.**—An induction coil apparatus for producing faradic currents.

**Faradic Irritability.**—Muscular contractions produced by the action of faradic currents on a nerve.

**Faradic Machine.**—Any machine for producing faradic currents.

**Faradism.**—A word sometimes employed for faradization.

**Faradization.**—In electro-therapeutics, the effects produced on the nerves or muscles by the use of faradic currents.

**Faradization of Skin.**—Treatment of the skin by faradic currents.

**Fast Repeater.**—A telegraphic repeater or translator especially designed for rapid signalling.

**Faradometer.**—A term proposed for an instrument designed for the measurement of faradic currents.

**Fast-Speed Telegraphy.**—Automatic or machine telegraphy.

**Fathom.**—(1) A unit of length equal to six feet or two yards. (2) Approximately the one-thousandth part of a nautical mile.

**Fault.**—Any defect in the proper working of a circuit, due to ground contacts, cross contacts, or disconnections.

**Fault Resistance.**—The resistance of a fault.

**Fault Searcher.**—An instrument employed in connection with a telephone or other sensitive current-detector, for determining the moment when a portion of the cable containing the fault comes on board ship, while the same is being picked up for purposes of repair.

**Feather Edge.**—A strip of wood laid by the side of a layout of cable in a cable tank to protect it from the pressure of superincumbent flakes.

**Feed.**—(1) To supply with an electric current. (2) To move or regulate one or both of the carbon electrodes in an arc-lamp.

**Feed-Line.**—A feeder.

**Feed-Wire Insulator.**—An insulator employed for the support of a feed-wire.

**Feeder.** One of the conducting wires through which the current is distributed to the main conductors, as distinguished from a conductor which supplies transmitting devices directly.

**Feeder-and-Main System of Distribution.**—A system for the transfer of electric energy in which, for the purpose of preventing too great a drop of

pressure on the mains, they are connected at suitable points to the feeder wires, instead of to the generator or generators.

**Feeder Ammeter.**—An ammeter placed in the circuit of a feeder, usually at a switchboard.

**Feeder Block.**—A block containing a feeder cut-out.

**Feeder Box.**—A distribution box supplied by a feeder, into which a feeder enters to receive its distributing connections.

**Feeder Clamp.**—Any clamping device for connecting or fastening a feeder wire to a trolley wire or to a main.

**Feeder Clout.**—A clamp furnished with a device whereby a feeder wire may be readily connected to a trolley wire.

**Feeder Distribution.**—A feeder-and-main system of distribution.

**Feeder Equalizer.**—A resistance coil inserted in the circuit of a feeder, with or without means for adjustment, for the purpose of equalizing the pressure at the feeding points.

**Feeder-Equalizer Resistance.**—A feeder regulator.

**Feeder-Equalizer Switch.**—An equalizer switch employed in feeder systems.

**Feeder for Trolley Conductor.**—A wire or conductor of low resistance employed for transmitting electric pressure directly from the power station to some distant point of the trolley wire, for the purpose of maintaining the potential at that point.

**Feeder-Mechanism for Arc-Lamps.**—An arc-lamp feeding mechanism.

**Feeder Panel of Switchboard.**—A panel of a switchboard, furnished with the necessary switches, voltmeters, ammeters, and safety devices, to which the feeder wires are connected.

**Feeder Plug.**—A metallic bolt which, when inserted in a trolley car in place of an insulated bolt, establishes connection between the trolley wire and a feeder through the span wire.

**Feeder Potential.**—(1) The electric potential of any feeder relatively to ground. (2) The difference of potential between any pair of feeder conductors.

**Feeder Regulators.**—(1) Artificial resistances introduced into the circuit of idle feeders, so as to increase the drop of pressure existing in them. (2) A form of special transformer, whose primary is connected across the mains and its secondary in series with one feeder wire, and is employed to produce a pressure which, by means of a suitable reversing switch,

either aids or opposes the alternating pressure on the mains. (3) A term sometimes applied to boosters.

**Feeder Switch.**—Any switch placed on a feeder panel that is connected with the separate feeders and employed for the purpose of connecting or disconnecting a generator with such feeder.

**Feeder System.**—A system of distribution in which the service wires are connected by means of feeders to certain centres of distribution.

**Feeder Tubes.**—Underground tubes provided for the reception of the feeder wires.

**Feeders.**—Wires supplying currents to main conductors at different points, to equalize their potential under load, as distinguished from wires supplying currents directly to the load.

**Feeding Centre.**—(1) A centre of distribution supplied by a feeder. (2) A feeding point.

**Feeding Conductors or Wires.**—Feeders.

**Feeding Device or Mechanism for Electric Arc-Lamps.**—A device for maintaining the carbon electrodes of an arc-lamp at a constant distance apart during their consumption.

**Feeding Point.**—(1) A point of connection between a feeder and the mains. (2) A feeding centre.

**Fender.**—A device placed in front of a street car for preventing accidental injury to pedestrians passing in front of the moving car.

**Ferranti Effect.**—(1) An increase in the electromotive force or difference of potential of mains or conductors carrying alternating currents, which exists towards the end of the same furthest from the terminals that are connected with the source. (2) A negative drop in pressure.

**Ferric Circuit.**—A ferric-magnetic circuit.

**Ferric Inductance Coil.**—An inductance coil provided with an iron core.

**Ferric Magnetic Circuit.**—A magnetic circuit composed wholly of iron.

**Ferric Path of Reluctivity.**—That portion of the flux paths through iron or other magnetic material, in which the flux passes through the metal proper, as distinguished from that which is assumed to pass through the ether lying within such material.

**Ferro-Magnet.**—A word sometimes employed for an ordinary magnet made of paramagnetic material, as distinguished



**Terre's Magnetism.**—See *form of the magnetism*.

**Terre's Magnetism.**—A word sometimes employed for *paramagnetism*.

**Terre's Magnetic Substances.**—*Paramagnetic substances*.

**Terre's Magnetism.**—Magnetism produced by *terre's* *paramagnetic substances*.

**Terre's Manganese Alloys.**—Various alloys composed for the uses of *insulation* and *electric resistance* in the industry affected by changes of temperature.

**Terre Suspension.**—Suspension of a *crystal* or other system in a film of *quartz*, *quartz* or other suitable material.

**Throns.**—A variety of *insulating material*.

**Ticative Layers.**—Layers in a dielectric possessing *equivalent* surfaces due to the accumulation of charges throughout to produce a constant potential within the dielectric, but nevertheless, capable of modifying its potential.

**Tidinal Point.**—(1) A fixed point or reference point in the scale or indications of a *micrometer* or other measuring instrument. (2) A temporary zero point.

**Field.**—(1) A term sometimes used for a magnetic field. (2) A term sometimes used for an *electrostatic field*.

**Field Coils.**—The field-magnet coils of a *hydroelectric machine* or motor.

**Field, Electric.**—A term sometimes used in place of *electrostatic field*.

**Field Frequency.**—The frequency of revolution in a rotating magnetic field.

**Field-Magnet Coils.**—The magnetizing coils on the field magnets of a dynamo or motor.

**Field-Magnet Regulating Box.**—(1) The field regulating box. (2) A resistance box inserted in the circuit of the field magnets.

**Field Magnets.**—The magnets which produce the magnetic field or flux in which the armature of a dynamo or motor rotates.

**Field of Force.**—(1) The space traversed by *electrostatic* or magnetic flux. (2) An *electrostatic* or magnetic field.

**Field of Vortex Ring.**—The field of influence produced by a vortex ring.

**Field Poles.**—The poles of the field magnets of a dynamo or motor.

**Field-Regulating Box.**—(1) A resistance box, inserted in series with the field magnet coils, for the purpose of varying the

strength of the magnetizing current. (2) A regulating box or rheostat connected with the field circuit of a dynamo for the purpose of controlling its frequency.

**Field Rheostat.**—A field-regulating box.

**Field Spools of Dynamo or Motor.**—The magnetizing coils of the field magnets of a dynamo or motor.

**Field Strength.**—The magnetic intensity of a field.

**Field Telegraph Line.**—A semi-permanent telegraph line employed in many telegraphs, connecting head stations with the terminal terminals, and such other stations as may be required.

**Field Windings of Induction Motor.**Field windings are arranged so as to produce a rotating magnetic field when supplied by multiphase or unipolar currents.

**Fieldless Motor.**—A form of motor in which the torque is obtained by the mutual attraction of separate armatures.

**Figure-of-Eight Wire.**—A trolley wire whose cross-section resembles in outline the figure 8.

**Figure of Merit of Galvanometer.**—The reciprocal of the current strength required to produce a deflection of a galvanometer needle through one division of the scale.

**Figures, Electric.**—Figures of various shapes produced on electrified surfaces by the arrangement of dust particles, or vapor vesicles, under the influence of electric charges.

**Filament.**—A slender thread or fibre.

**Filament of Incandescent Lamp.**The incandescing conductor of an incandescent electric lamp.

**Filament Shadows.**—Markings produced on the inner surface of an incandescent lamp chamber by the deposition thereon of carbon from the filament.

**Filamentous Armature Core.**—A laminated armature core formed of iron wire.

**Filar Micrometer.**—A micrometer ocular in which an angular or linear distance is measured by the movement of a wire across the field of view, under the control of a screw adjustment.

**Film.**—(1) A thin pellicle or layer. (2) A name sometimes given to an electroplating or deposit.

**Film Cut-Out.**—(1) A cut-out in which a film or sheet of paper, or mica, is interposed between a line plate and the earth plate, which, when punctured by a spark, short-circuits the instruments on the



line. (2) A cut-out for a series incandescent lamp, in which a film of paper or other insulator is interposed between the lamp terminals, so that when the filament breaks, the pressure rises at the terminals and both punctures and short circuits the film, thus cutting out the broken lamp.

**Film Lightning-Arrester.**—A film-cut-out lightning-arrester.

**Filter Pump.**—A pump employed for increasing the rapidity of filtration of a liquid by atmospheric pressure.

**Filtration.**—The separation of a liquid from an undissolved solid or solids mechanically suspended therein.

**Final Cable Test.**—(1) The test made after a cable is laid, to ascertain if the electrical specifications have been met.

**Final Cable Splice.**—(1) The splice in a cable which completes it. (2) The last splice.

**Finding Earth.**—In telegraphy, making earth.

**Finishing Brushes.**—In electro-plating, finer brushes than scratch brushes, employed for polishing.

**Fire-Alarm Annunciator.**—An annunciator used in connection with a system of fire alarms.

**Fire-Alarm Contact.**—A contact so arranged that an alarm is automatically given when a predetermined temperature is reached.

**Fire-Alarm Signal-Box.**—A signal box placed in a street, or other convenient position, by means of which an alarm of fire can be sent.

**Fire-Alarm Telegraph.**—A general term embracing the apparatus employed in fire-alarm telegraphy.

**Fire-Alarm Telegraphy.**—A system of telegraphy by means of which alarms can be sent to a central station, or to the fire-engine houses in a district, from call-boxes placed on the line, or from automatic fire-alarm contacts.

**Fire Ball.**—A term sometimes applied to globular lightning.

**Fire Cleansing.**—Removing grease by the action of fire from articles that are to be electro-plated.

**Fire Extinguisher, Electric.**—A thermostat or mercurial contact, which automatically completes a circuit and thus turns on a water jet for extinguishing a fire, on a certain predetermined increase of temperature.

**Fire-Fly Radiation.**—Any form of luminous radiation containing a small proportion of non-luminous frequencies, and, in this respect, similar to the radiation of the fire-fly or glow-worm.

**Fire-Glow.**—A term employed by the ancients for an aurora.

**Fire Telegraph.**—A fire-alarm telegraph.

**Firing Battery.**—A battery employed in mining, in military, or in naval operations for firing a fuse.

**Firing Filament.**—(1) Subjecting suitably shaped carbonizable material to the carbonizing process, so as to prepare it for use as the filament of an incandescent lamp. (2) Carbonizing a filament.

**Firing Rheostat.**—A rheostat in the firing circuit of a fuse detonator.

**Fish Plate.**—In a system of electric railroads, the plate connecting contiguous rails by bolts.

**Fished Wires.**—Wires that have been introduced into ducts by the application of the fishing process.

**Fishes, Electric.**—Various fishes, such as the eel and the ray, which possess the ability of either protecting themselves, or securing their prey, by giving electric shocks to the objects touching them.

**Fishing Box.**—A term sometimes used for junction box.

**Fishing Conductors.**—The process of threading conductors through the spaces left for them in floors, walls, tubes, or conduits by securing their ends to the end of a convenient length of wire and hauling the latter through in advance.

**Fishing Process.**—The process employed for the fishing of wires.

**Fishing of Wires.**—The process of drawing a wire into its place in a building through floors, walls, or ceilings by placing a wire in a hole at one end and engaging it by a hook from the other, so as to draw it through.

**Fiske's Electric Range-Finder.**—A device by means of which the distance of an object can be readily obtained.

**Fiske's Electric Range-Finder.**—A device by means of which the exact distance of an enemy's ship or other target can be readily determined.

**Fittings.**—(1)—The sockets, holders, arms, etc., required for holding and supporting incandescent electric lamps. (2) Incandescent light fixtures.

**Five-Point Jack.**—In a multiple telephone switchboard, a jack having five separate contact points.

**Five-Point Branching Jacks.**—In a multiple telephone branching switchboard, the point jacks connected in parallel to a common line.

**Five-Wire System.**—A system similar in its arrangement to the three-wire system, in which three series-connected dynamos are electrically connected to five wires of uniform size.

**Fixed Call-Boxes.**—District call-boxes so arranged with burglar-alarm circuits that the alarm is sent to the district station connected therewith.

**Fixed Electric Lamp.**—A stationary incandescent lamp as distinguished from a portable lamp.

**Fixed Resistance.**—A resistance whose value is approximately constant, as distinguished from a regulable resistance.

**Fixed Secondary.**—The secondary of an induction coil that, as is common in such cases, is fixed, in contradistinction to a portable secondary.

**Fixture Cut-Out.**—A cut-out or safety plug attached to an electric lamp.

**Fixture Electric.**—1. Fittings for electric light. 2. A support or electrolier for one or more incandescent lamps rigidly fastened to a wall or ceiling. 3. Any electric apparatus forming part of a permanent installation.

**Fixture Wire.**—A class of insulated wire suitable for use in electric fixtures.

**Flag of Balance.**—A small arm pivoted friction-tight upon the movable coils of an electro-dynamometer balance, and capable of adjustment for the purpose of obtaining a correct initial balance.

**Flag Signalling.**—A system of semaphoric signalling in which a light flag, held in the hand, is waved to the left for the dots, and to the right for the dashes, of the Morse or Continental Code.

**Flake of Cable.**—A single horizontal layer of a coiled cable.

**Flame.**—A mass of inflammable gas in a state of combustion.

**Flaming Discharge.**—The white, flaming, arc-light discharge that occurs between the terminals of a high-frequency, high-potential induction coil, when the current through the primary is increased in strength beyond that required for the sensitive-thread discharge.

**Flaming of Carbon Arc.**—An irregular burning of a voltaic arc, which occurs when the carbons are too far apart, and the current strength somewhat exceeds the normal.

**Flash Signalling.**—A method of semaphoric signalling by means of a lantern, or torch.

**Flashed Carbon Filaments.**—Carbon filaments that have been subjected to the flashing process.

**Flashing.**—Subjecting carbons to the flashing process.

**Flashing Lights.**—(1) Lights employed in light-house illumination, that are periodically shaded, so as to produce an intermittence of the light, and thus to permit such light to be readily distinguished from adjacent lights. (2) Any lights whose intensity is periodically interrupted.

**Flashing of Dynamo-Electric Machine.**—A name given to long flashing sparks at the commutator of a dynamo, due to the short-circuiting of the external circuit at the commutator.

**Flashing Process for Carbon Filaments.**—A process for improving the electrical homogeneity of carbon filaments by the deposit of carbon in their pores and over their surfaces, by exposing the filaments to a gradually increasing electrical incandescence, while surrounded by a carbonaceous gas or liquid.

**Flat Board.**—A multiple telephone-switchboard whose surface lies in a horizontal plane, as distinguished from a vertical board.

**Flat Cable.**—A cable the separate conductors of which are laid up side-by-side, so as to form a flat-conductor.

**Flat Commutator-Segment.**—A commutator segment that has, through wear or otherwise, acquired a flat surface.

**Flat Duplex-Cable.**—A flat cable containing two separate conductors which are laid up side-by-side.

**Flat-Iron, Electric.**—An electrically heated flat-iron.

**Flat-Ring Armature.**—An armature whose core has the shape of a short cylindrical ring.

**Flats.**—Those parts of commutator segments, the surfaces of which, through wear or otherwise, have become lower than the other portions.

**Fleeting Knife of Cable Gear.**—The adjustable guide on the drum of a cable machine, which leads the cable to the surface of the drum.

**Flexible.**—Capable of being readily flexed or bent.

**Flexible Cable.**—A stranded cable, or one which can be readily flexed or bent.

**Flexible Conduit-System.**—A system of conduits for underground wires, so constructed that the conductors or cables it is to contain can be introduced at any time after its completion.

**Flexible Electric Heater.**—An electric heater made of flexible material, so as to permit its local application to different parts of the body.

**Flexible Electric-Light Pendant.**—A pendant for an incandescent lamp, formed by its flexible supporting conductors.

**Flexible Lamp-Cord.**—(1) A flexible cord provided for supporting an incandescent lamp. (2) A flexible cord maintaining electric connection with a semi-portable incandescent lamp.

**Flexible Lead.**—A conductor that is stranded for the purpose of obtaining flexibility.

**Flexible Twin-Lead.**—A lead containing two separate parallel stranded conductors.

**Float Dynamometer.**—A dynamometer for measuring the mechanical activity of a dynamo or motor in which the machine is supported in a floating cradle and connected to its driver or load through a flexible coupling.

**Floor-Contact.**—A contact placed on the floor and arranged so as to be readily operated by the foot.

**Floor Push.**—A form of floor contact.

**Flow.**—(1) The quantity of liquid escaping from an orifice in a given time. (2) The quantity of a fluid that flows past a given point in a given time.

**Flow, Electric.**—Electric current.

**Flow of Energy.**—The transmission of energy through the medium or dielectric surrounding a conductor, now regarded as carrying the current of electricity which was formerly assumed to flow through the conductor.

**Flow of Electrostatic Flux.**—The transference of electrostatic flux which constitutes, in reality, the so-called flow of electric current through a conductor.

**Flow of Heat.**—The quantity of heat which passes through a thermal conductor when subjected to a certain difference of temperature.

**Flow of Magnetic Flux.**—(1) The quantity of magnetic flux which passes through any magnetic circuit, under a given magnetomotive force, against a given magnetic reluctance. (2) The time-rate of change of magnetic flux through a magnetic circuit.

**Flow of Magnetic Induction.**—The transmission of magnetic flux from one point of a magnetic circuit to another.

**Fluctuating Electromotive Force or Current.**—An electromotive force or current which varies periodically in magnitude.

**Fluid.**—(1) Any substance which readily flows. (2) A liquid or a gaseous substance.

**Fluid Depolarizer.**—A fluid substance employed in a voltaic cell as a depolarizer.

**Fluid, Electric.**—Either of the assumed fluids which were formerly believed to be the cause of electric excitement.

**Fluid Insulator.**—An oil insulator.

**Fluidity.**—Possessing the properties of fluids.

**Fluorimeter.**—A fluoroscope.

**Fluoresce.**—To become luminous when exposed to radiant energy.

**Fluorescence.**—The property possessed by certain solid and liquid substances of becoming luminous when exposed to radiant energy.

**Fluorescent.**—Possessing the capability of fluorescing.

**Fluorescent Screen.**—A screen covered with fluorescent materials.

**Fluorescing.**—Emitting fluorescent light.

**Fluorograph, Electric.**—A visible X-ray picture obtained on a fluorescent screen.

**Fluoroscopic Examination.**—An X-ray examination of the human body by means of a fluorescent screen.

**Fluoroscopic Screen.**—A screen covered with fluorescent material, and used in connection with the X-rays for fluoroscopic examination.

**Fluoroscopy.**—The art of examining the body by X-rays in connection with a fluoroscopic screen.

**Flush Box.**—A box or space, flush with the surface of a road-bed, provided, in a system of underground wires or conduits, to facilitate the introduction of a conductor into the conduit, or the examinations of the conductors.

**Flush Key-Switch.**—A key switch that is flush with, or does not project beyond, the surface of the wall in which it is placed.

**Flush of Current of Arc-Lamp.**—The current that flows into an arc-lamp on starting, and which greatly exceeds in strength that which flows after the normal arc has been established.

**Flush Plate.**—A plate on which flush push-buttons are mounted.

**Flush Push.**—A push the upper surface of whose button or buttons are flush with the surface of the wall or plate in which it is placed.

**Flush Switch.**—Any switch sunk in a wall, so that its plane outer surface is flush with the surface of the wall.

**Fluviograph, Electric.**—An apparatus for electrically registering the varying height of water in a tidal stream, or in the ocean, or, in general, for any differences of water level.

**Flux.**—(1) Magnetic or electric flux. (2) A surface integral of a vector quantity.

**Flux Density.**—The quantity of magnetic flux per unit of area of normal cross-section.

**Flux Density per-Square-Centimetre or per-Square-Inch.**—The quantity of magnetic flux passing through a circuit per square inch or square centimetre of area of normal cross-section.

**Flux of Displacement.**—The surface integral of electric displacement passing through a closed curve.

**Flux, Electric.**—Electrostatic flux.

**Flux Horn.**—A term proposed for the leading horn or polar edge of a generator which supplies the magnetic flux necessary for reversing the current in the armature coil under commutation.

**Flux Intensity.**—(1) The density of a flux. (2) The surface density of a vector quantity at a point.

**Flux Leakage.**—Any failure of flux to pass through its proper receptive device.

**Flux Lines of Electrostatic Force.**—The lines or paths traversed by electrostatic force.

**Flux of Heat.**—The flow of heat per unit of time through a given area.

**Flux of Light.**—(1) The total quantity of light emitted through a given area by a luminous source. (2) The total quantity of light emitted from a point source.

**Flux of Magnetic Induction.**—The flow of magnetic induction.

**Flux of Magnetism.**—(1) The flow of magnetic induction. (2) The surface integral of magnetic induction through a given surface.

**Flux Oscillations.**—Oscillations in the intensity of electrostatic or of magnetic flux.

**Flux Phase.**—The phase of a simple-harmonic magnetic flux.

**Fly or Flyor, Electric.**—A light wire wheel provided with pointed radial arms, which is set into rapid rotation by the escape of convection streams from its points, when connected with a charged body.

**Flying Break of Armature Conductor.**—A discontinuity in an armature wire that can only be detected when the armature is rotating, owing to the influence of centrifugal force.

**Flying Soundings.**—Approximate soundings, in depths not exceeding two hundred fathoms, obtained without decreasing the speed of the ship below five or six knots per hour.

**Focal Length.**—(1) The distance of a focus from a lens. (2) When not otherwise specified, the principal focal length of a lens or mirror. (3) The distance from the optical centre of a mirror or lens at which parallel rays are brought to a focus.

**Focometer.**—An apparatus for readily determining the focus of a lens or optical combination.

**Focus.**—A point before or back of a mirror or lens, where all the rays of light coming from the lens or mirror either meet, or seem to meet.

**Focusing.**—Altering the distance between an object, and a lens or mirror, in order to obtain a sharp image of the object.

**Focusing Arc-Lamp.**—An arc-lamp designed for use in connection with a reflector or lens, whose mechanism feeds both carbons, and so permits the arc to be maintained at the focus of the reflector or lens.

**Fog, Electric.**—A dense fog which sometimes occurs when there is an unusually large quantity of free electricity in the atmosphere.

**Foiled Conductor.**—A term applied to a conductor whose insulating coating is covered by a thin coating or layer of tin foil or lead.

**Following Edges of Pole-Pieces of Motor.**—Those edges of the pole-pieces of a motor which the armature is leaving.

**Following Horns of Pole-Pieces of Dynamo.**—Those edges or terminals of the pole-pieces of a dynamo which the armature is leaving.

**Foot-Candle.**—A unit of illumination equal to the normal illumination produced by a standard candle at the distance of one foot.

**Foot-Grain.**—A standard for comparing the resistances of wires at a given tem-



perature, the length of the wire being one foot, and its weight one grain.

**Foot-Pound.**—(1) A unit of work. (2) The amount of work required to raise one pound vertically through a distance of a foot.

**Foot-Pound-per-Second.**—(1) A unit of activity. (2) A rate-of-doing-work equal to the expenditure of one foot-pound per second.

**Foot-Switch.**—A switch capable of being readily operated by the foot.

**Force.**—Anything which changes or tends to change the condition of rest or motion in a body.

**Force, Electric.**—The force exerted between electrostatic charges.

**Force of Field.**—The force in a magnetic or electric field independent of the impressed magnetic or electric force.

**Force of Flux.**—The total magnetic or electric force in a magnetic or electric field, as distinguished from the impressed magnetic or electric forces or from the force of a field.

**Force Pump.**—A pump provided with a solid piston, and employed for raising liquids through greater vertical heights than that through which such liquids could be raised directly by atmospheric pressure.

**Forced Electromagnetic Vibrations.**—Electro-magnetic vibrations that are set up in a system independently of its electro-magnetic dimensions.

**Forced Vibrations.**—A term employed for vibrations set up in a body independently of its nature and form, and other than the free vibrations which the body would acquire, if disturbed and then left to itself.

**Forge, Electric.**—A forge in which the metal to be operated on is electrically heated.

**Fork for Trolley Wheel.**—The mechanism which connects the trolley wheel to the trolley pole.

**Forked Circuits.**—(1) A term used in telegraphy for a number of circuits that radiate from a given central point. (2) In telegraphy, a circuit which divides into two branches, thus connecting three terminal stations.

**Forked Lightning.**—A variety of lightning flash, in which the discharge, on meeting the earth or other object, divides into two or more branches.

**Form Factor of Alternating-Current Curve.**—A factor equal to the square

root of the mean square divided by the true mean value of the alternating electromotive force or current.

**Formal Inductance of Circuit.**—That part of the counter-electromotive force of a circuit which depends on the form of the circuit.

**Formed Armature-Windings.**—Armature coils that are wrapped on a suitable form and afterwards placed on the armature core.

**Formed Plates of Secondary Cell.**—Plates that have been submitted to the forming process.

**Formers.**—The forms employed in obtaining formed armature or other windings.

**Forming Block.**—A block for holding the jack connections of a set or row in a multiple telephone switchboard, for convenience in soldering their contacts with cable conductors, before inserting the set in the switchboard panel.

**Forming Storage-Battery Plates.**—Obtaining thick coatings of peroxide of lead and of spongy lead respectively, on the lead plates of a storage battery, by repeatedly sending the charging current between them in alternately opposite directions, while immersed in dilute sulphuric acid.

**Formulæ.**—Mathematical expressions for some general law, rule, or principle.

**Forward Induction.**—An induction in the field of a motor or dynamo, in which the current in the armature coils produces an induction which assists the field, in contra-distinction to the back induction, which opposes the field.

**Forward Lead of Dynamo Brushes.**—A displacement of the brushes on the commutator of a dynamo in the direction of rotation of the armature.

**Forward Pitch of Armature Winding.**—A pitch which is always directed right-handedly, or clockwise, when viewed from the commutator side.

**Forward Waves.**—In a closed-current circuit supplied by a dynamo giving a harmonic-alternating electromotive force, the wave of induced potential that is assumed to travel through the circuit, from the positive pole of the dynamo to its negative pole.

**Foucault Currents.**—(1) A name sometimes applied to eddy currents, especially when in armature cores. (2) Useless currents developed in a conducting mass, through which varying magnetic flux is moving.

**Foucault Losses.**—Losses of energy in a dynamo or motor, due to Foucault currents.

**Foundation Trench.**—A trench dug to receive the masonry employed in a foundation.

**Fountain, Electric.**—A fountain operated by electric motors, provided with a variety of jets that are electrically illuminated by different colored lights.

**Fountain Projector.**—An arc-light projector employed in illuminating the jets of an electric fountain.

**Four-Conductor Cord.**—A flexible cord containing four separate insulated conductors.

**Four-Pole Switch.**—(1) A switch employed for making or breaking four contacts. (2) A switch employed to open or close a pair of diphasic circuits. (3) A double double-pole switch for diphasic circuits, one double-pole switch being provided for each circuit.

**Fourier's Series.**—A series of sines or of cosines of multiple arcs.

**Four-Piece Electro-Magnet.**—An electro-magnet constructed in four pieces; namely, two cores, a yoke and an armature.

**Four-Point Switch.**—(1) A switch whose circuit can be completed through four points, either singly, or simultaneously. (2) A four-pole switch.

**Four-Pole Dynamo-Electric Machine.**—A dynamo-electric machine whose magnetic field is produced by four magnet poles.

**Four-Speed Regulator.**—A regulator provided with a motor by which four different speeds can be obtained.

**Four-Way Splice-Box.**—A splice-box provided with four ways or tubular conduits.

**Four-Way Switch.**—A four-point switch.

**Four-Wire Diphasic-Circuit.**—A diphasic circuit, employing four wires in contradistinction to a three-wire diphasic circuit.

**Four-Wire System.**—A system similar in its general arrangement to the three-wire system, in which three dynamos are connected to four wires or conductors.

**Four-Wire Transmission.**—A system of electric transmission employing four conductors.

**Fourth State or Condition of Matter.**—The ultra-gaseous or radiant condition of matter.

**Fractional Distillation.**—(1) A method adopted for the separation of two or more liquids in solution, by first raising the liquid to the boiling point of the most volatile liquid, and retaining that temperature until all that liquid is evaporated, and then raising the temperature to that of the next most volatile liquid, and so on throughout. (2) The successive separation by distillation of liquids that volatilize at different temperatures.

**Fractional Electrolysis.**—Successive electrolysis of different substances by gradually raising the E. M. F.

**Fracture of Cable.**—A parting or rupture of a submarine cable.

**Frame of Dynamo or Motor.**—A dynamo or motor frame.

**Franklinic Alternating E. M. F.'s.**—Alternating electromagnetic forces obtained by means of a frictional or electrostatic-induction machine.

**Franklinic Currents.**—The currents produced by a frictional or electrostatic-induction machine.

**Franklinic Electricity.**—A term sometimes employed in electrotherapeutics for the electricity produced by a frictional or electrostatic-induction machine.

**Franklinism.**—A word sometimes employed for franklinization.

**Franklinization.**—A term employed in medical electricity for electrization by means of a frictional machine, as distinguished from faradization or electrization by means of an induction-coil.

**Franklin's Kite.**—The kite employed by Franklin in demonstrating the identity of lightning and electricity.

**Fraunhofer's Dark Lines.**—Spaces in the otherwise continuous spectrum of the sun where certain frequencies are absent.

**Free Charge.**—The condition of an electric charge on a conductor isolated from other conductors.

**Free Ether.**—A term sometimes employed for the ether that exists in the interplanetary spaces, as distinguished from the inter-molecular or inter-atomic ether.

**Free Electricity.**—(1) In the old double-fluid hypothesis, a term employed for either the positive or the negative electricity when it is freed from the influence of the other. (2) A term sometimes employed for a charge on an insulated conductor that is isolated from other conductors. (3) A term sometimes employed for the electricity contained in a free charge.

**Free Insulated.**—The condition of a telegraph wire when it is disconnected from its apparatus and left insulated.

**Free Magnet Pole.**—A pole in a piece of iron or other paramagnetic substance which acts as if it existed as one magnetic pole only.

**Free Magnetism.**—(1) In the theory of magnetic matter, magnetism resident upon the polar surface of a magnet and not neutralized by opposite polarity. (2) That portion of the imaginary magnetic matter of a magnet that is distributed over the surface of the magnet.

**Free Path.**—That path of a gaseous molecule in which it does not collide or strike against another molecule.

**Free Vibrations.**—Vibrations dependent on the consistency and shape of a body acquired when the body is acted on by a disturbing force and then left to itself.

**Freezing.**—Congealing or assuming the solid state by loss of heat.

**Freezing Mixtures.** Various mixtures, such as salt and ice, which melt or dissolve on being mixed, and thus absorb sensible heat from themselves, or from surrounding substances.

**Freezing of Shaft in Bearing.**—The fixing of a shaft in its bearing by the liquefaction and subsequent cooling of its anti-friction metal.

**Freezing Point.**—The point of congelation of a liquid.

**French Measures and Weights.**—A system of measures and weights employed generally in physical science, based on the metre as the unit of length, and the gramme as the unit of weight.

**French Standard Candle.**—The bougie-de-mètre or the twentieth part of a Vielle.

**Frequency of Alternation.**—(1) The number of cycles or periods executed by an alternating current in unit time. (2) The periodicity. (3) The number of alternations or half-cycles executed by an alternating current in a second or in a minute.

**Frequency Setter.**—In an alternating-current circuit having induction machines, an alternator which supplies them with a definite frequency.

**Frequency Teller.**—A device for determining the frequency of an alternating current.

**Friable.**—Easily crumbled or pulverized.

**Friction.**—Resistance to the sliding or rolling motion of one body over another.

**Friction Brake.**—(1) A Prony brake. (2) Any form of brake dependent for its operation on friction.

**Fringe of Lines of Force.**—A term sometimes used for fringe of magnetic field.

**Friction, Electric.**—A term sometimes employed for electric resistance.

**Frictional Electric Machine.**—A machine for the development of electricity by friction.

**Frictional Electricity.**—The electricity developed by friction.

**Frictional Torque.**—(1) Torque developed by friction. (2) In a motor the torque necessary to exert on the armature in order to overcome its friction.

**Fringe of Magnetic Field.**—The lateral extension or diffusion of magnetic flux from the edge of a pole piece whereby the field is not restricted to the space covered by the pole, but extends with diminishing intensity to a greater area.

**Frog.**—(1) A metallic guide placed on one side of a single track, where a car has to be driven from one track to another, so as to guide the car in the required direction. (2) A grooved piece of metal, serving as a guide, at the intersection of two rails in a track-crossing. (3) A trolley frog.

**Front Door Pull.**—A circuit-closing device operated by a pull at a front.

**Front Stop of Key.**—A stop placed on the front of a telegraphic key in order to restrict its motion in a downward direction.

**Frost Alarm.**—An electric alarm sounded or set in operation by means of a mechanism operated by a fall of temperature to or below the freezing point of water.

**Frying of Arc.**—The frying sound that accompanies a voltaic arc when the carbons are too near together.

**Fulgurite.**—A tube of vitrified sand believed to be formed by a lightning discharge into the ground.

**Full Battery.**—A complete battery employed in the quadruplex system, as distinguished from a reduced battery.

**Full Contact.**—A complete contact.

**Full Load.**—(1) An entire load. (2) The maximum load which a machine is designed to carry permanently.

**Full-Load Current.**—The current of maximum load of a source or station.

**Full-Load Efficiency of Motor.**—The efficiency of a motor when operating at full load.

**Full-Load Efficiency of Transformer.** The efficiency of a transformer, or the ratio of the power yielded at secondary



terminals to the power absorbed at primary terminals, when operating at full load.

**Full Metallic-Contact.**—A contact which, from its small resistance, establishes a complete connection.

**Fuller Voltaic Cell.**—A zinc-carbon couple immersed in a solution of electrotonic liquid and provided with a layer of mercury around the lower part of the zinc.

**Fulminate.**—A name given to a class of highly explosive compounds.

**Fundamental Frequency.**—The nominal or lowest frequency of a complex harmonic electromotive force, flux or current.

**Fundamental Tone.**—The lowest or dominant tone, or that on which the pitch of a musical note is dependent.

**Fundamental Units.**—(1) The units of length, time, and mass, to which all other quantities can be referred. (2) Units of length, time, and mass, as distinguished from their derivations, or derived units.

**Furnace, Electric.**—A furnace in which electrically generated heat is employed for effecting difficult fusions, for the extraction of metals from their ores, or for other metallurgical operations.

**Fuse Block.**—A block containing a safety fuse or fuses.

**Fuse Board.**—A board of slate, or other infusible material, on which the safety

fuses in a given installation are assembled.

**Fuse Box.**—(1) A box containing a safety fuse. (2) A box containing fuse wires.

**Fuse Carrier.**—A fuse block.

**Fuse, Electric.**—(1) A device for electrically igniting a charge of powder, by the heat generated in a small strip, wire or mass of poorly conducting material. (2) A safety wire or catch.

**Fuse Holder.**—A device for holding or protecting a safety fuse.

**Fuse Links.**—Strips or plates of fusible metal in the form of links employed for safety fuses.

**Fuse Panel.**—A panel in a switchboard provided for the support of safety fuses.

**Fuse Ribbons, Strips, or Wires.**—Material for safety fuses in the form of ribbons, strips, or wires.

**Fused Electrolytic Bath.**—An electrolytic bath in which the electrolyte is maintained in a state of fusion during electrolysis by means of heat.

**Fusible Arrestor.**—A safety catch.

**Fusible Plug.**—A term sometimes applied to a safety plug.

**Fusible Protector.**—A safety fuse which acts as a line protector.

**Fusing Current.**—A term sometimes applied to the current which causes a fuse to blow or melt.

## G

**g.**—(1) An abbreviation or symbol for the gravitation constant, or the force with which the earth acts upon unit mass at any locality. (2) An abbreviation proposed for gramme, the unit of mass in physical investigations.

**g.**—In telegraphy, an abbreviation for "go ahead."

**g. cm<sup>2</sup>.**—An abbreviation proposed for the gramme centimetre-squared, the centimetre-gramme-second unit of moment of inertia.

**G. M. D.**—A contraction for geometrical mean distance.

**G. M. T.**—A contraction for Greenwich mean time, the standard time used in submarine telegraphy.

**G. P.**—A contraction for gutta-percha.

**Gain Plate of Copper Voltameter.**—The plate of a copper voltameter that increases in weight due to the deposition on it of metallic copper.

**Gains.**—The spaces cut in the faces of telegraph poles for the support and placing of the cross arms.

**Galvanic Adapter.**—An apparatus for obtaining from an electric light circuit feeble continuous currents such as are used in electro-therapeutic applications.

**Galvanic Arc.**—A term sometimes used for a voltaic arc. (Not in general use.)

**Galvanic Battery.**—An undesirable term sometimes used in place of voltaic battery.

**Galvanic Cabinet.**—A suitably shaped box provided with a voltaic battery and all the accessories necessary for its use in electro-therapy.

**Galvanic Caution.**—A term sometimes used in place of electric caution.

**Galvanic Cell.**—A name sometimes used in place of voltaic cell.

**Galvanic Chain.**—A galvanic circuit.



**Galvanic Circle.**—A term sometimes used for galvanic circuit.

**Galvanic Circuit.**—A name sometimes used for voltaic circuit.

**Galvanic Couple.**—A name sometimes given to a voltaic couple.

**Galvanic Dosage.**—A name sometimes given to electro-therapeutic dosage.

**Galvanic Electricity.**—An undesirable term sometimes used in place of voltaic electricity.

**Galvanic Etching.**—A term sometimes used for electric engraving.

**Galvanic Excitability.**—A term sometimes used for electric excitability of nervous or muscular fibre.

**Galvanic Induction.**—A term sometimes used for voltaic induction.

**Galvanic Irritability.**—Muscular contractions produced by the action of voltaic currents.

**Galvanic Multiplier.**—A term formerly applied to a galvanometer.

**Galvanic Polarization.**—A term sometimes applied to the polarization of a voltaic cell.

**Galvanic Ring.**—A term sometimes applied to a voltaic circuit.

**Galvanic Taste.**—The sensation of taste produced when a voltaic current is passed through the tongue.

**Galvanism.**—An inelegant term sometimes employed to express the effects produced by voltaic electricity.

**Galvanist.**—One skilled in the art of galvanism. (Obsolete.)

**Galvanized.**—(1) Subjected to the influence of galvanism. (2) Covered with a coating of zinc by immersion in a bath of molten zinc.

**Galvanized Iron.**—Iron coated with zinc.

**Galvanized Iron Wire.**—A zinc-coated iron wire.

**Galvanizing.**—(1) Covering iron with an adherent coating of zinc by dipping it in a bath of molten metal. (2) Subjecting a nerve or muscle to the action of galvanism.

**Galvanizing Wire.**—Covering wire with a coating of zinc by dipping it in a bath of molten metal.

**Galvano.**—A word sometimes used in place of electro, either for an electro-type or for an article reproduced in copper by electro-metallurgy.

**Galvano-Cautic Loop.**—(1) A loop of platinum wire suitably supported, so as to be shortened at will, and employed for re-

moving diseased growths by drawing it, while heated to electric incandescence, through the parts to be removed. (2) An electric cautery.

**Galvano-Cautics.**—A term sometimes employed for the destruction of diseased tissues by electrolysis.

**Galvano-Caustic.**—A term sometimes employed for galvano-cautery.

**Galvano-Cautery.**—An electric cautery.

**Galvano-Electric Cautery.**—An electric cautery.

**Galvano-Faradization.**—(1) In electro-therapeutics, the simultaneous excitation of a nerve or muscle, by both a voltaic and a faradic current. (2) A pulsating, continuous current.

**Galvanoglyphy.**—A word proposed for the process of producing an electro-type. (Not in use.)

**Galvanography.**—The process of building up a picture in colored varnish, whose varying thickness gives the necessary gradations of light and shade; subsequently black-leading the picture, and depositing a layer of copper by electro-plating, and employing the finished picture as an engraved plate for printing.

**Galvano-Magnet.**—A word sometimes used for electro-magnet. (Not in use.)

**Galvano-Magnetic.**—A word proposed for electro-magnetic. (Not in use.)

**Galvano-Magnetism.**—A word proposed for electro-magnetism. (Not in use.)

**Galvanometer.**—(1) An apparatus for measuring the strength of an electric current by the deflection of a magnetic needle. (2) A current measurer.

**Galvanometer Constant.**—(1) The constant of calibration of the galvanometer scale. (2) The numerical factor connecting a current passing through a galvanometer with the deflection produced by such current. (3) The value of one division of the galvanometer scale in terms of resistance or current strength.

**Galvanometer Shunt.**—A shunt placed around a sensitive galvanometer in order to protect it from the effects of a strong current, or for reducing its sensibility.

**Galvanometer Switch.**—A switch employed with a dynamo balance-galvanometer.

**Galvanometer Voltmeter.**—Any form of galvanometer arranged so as to readily measure a difference of potential.

**Galvanometric.**—Of or pertaining to a galvanometer.

**Galvanometrical.**—Of or pertaining to a galvanometer.

**Galvanometrically.**—In the manner of a galvanometer.

**Galvanometry.**—The determination of the current strength by means of a galvanometer.

**Galvano-Plastic Adhesion.**—Adhesion to surfaces produced by a galvano-plastic deposit between them.

**Galvano-Plastic Bath.**—A plating bath.

**Galvano-Plastic Matrix.**—A mould in which a galvano-plastic deposit is made.

**Galvano-Plastic Soldering.**—Uniting two metallic surfaces by a metallurgical deposit.

**Galvano-Plastics.**—(1) A term sometimes employed for electrotyping, or for producing an electrolytic deposit sufficiently thick to permit of its ready separation from the object on which it has been deposited. (2) Literally, the cold moulding or shaping of metals by electrotyping.

**Galvano-Plasty.**—Galvano-plastics.

**Galvano-Puncture.**—A term sometimes used for electro-puncture.

**Galvanoscope.**—(1) A galvanometer intended to show the existence of a current rather than to measure its strength. (1) A crude or simple form of galvanometer.

**Galvanoscopic Frog.**—The hind legs of a recently killed frog, employed as an electro-scope or galvanoscope, by sending electric currents from the nerves to the muscles.

**Galvano-Therapeutics.**—An objectionable term sometimes employed for electro-therapeutics.

**Galvano-Thermal Cautery.**—A term sometimes used for electric cautery.

**Galvanotonus.**—A term proposed for the state of tetanus produced in a muscle that has been over-stimulated electrically.

**Galvanotropism.**—Movements produced in living organisms by the passage of electricity through them.

**Gap Space.**—The air-gap or entrefer.

**Gap Wire Gauge.**—A form of wire gauge in which a gap or set of gaps is left in a plate of metal which may be bridged or filled by the wire to be measured.

**Gas Battery.**—A battery formed of gas cells.

**Gas-Burner, Electric.**—An electric gas-burner that can be electrically turned on and lighted, or electrically lighted after it has been turned on by hand.

**Gas Cell.**—A voltaic couple formed of metals in the presence of gases instead of solids as usual.

**Gas Engine.**—An engine whose motive power is derived from the heat of burning gas.

**Gas-Flame Photometric-Standard.**—A gas jet photometer.

**Gas-Jet Photometer.**—A photometer in which the standard of light is a gas jet burning with or without a diaphragm at a definite height under standard conditions of volume and pressure.

**Gas-Lighting, Electric.**—The electric ignition of a gas jet from a distance.

**Gas-Lighting Torch.**—A gas-lighting appliance, consisting of the combination of a portable voltaic battery and a spark coil.

**Gas Polarization.**—A term sometimes employed for that form of polarization which is due to the collection of hydrogen gas on the negative plate of a voltaic cell.

**Gas Voltameter.**—A voltameter whose indications are based on the volume of gas liberated at a fixed pressure and temperature.

**Gassing.**—The evolution of gas from the plates of a secondary or storage battery.

**Gastroscope, Electric.**—An electric apparatus for the illumination and inspection of the human stomach.

**GastroscoPy.**—The examination of the stomach by the gastroscope.

**Gauge, Electric.**—Any form of portable galvanometer suitable for ordinary testing work.

**Gauss.**—(1) The name proposed in 1894 by the American Institute of Electrical Engineers for the C. G. S. unit of magnetic flux density. (2) A unit of intensity of magnetic flux, equal to one C. G. S. unit of magnetic flux per-square-centimetre of area of normal cross-section. (3) A name proposed for the C. G. S. unit of magnetic potential or magnetomotive force by the British Association in 1895.

**Gaussage.**—(1) The value of the magnetic intensity in gaussess. (2) A name proposed for the value of the M. M. F. in gaussess.

**Gauze Brushes for Dynamo or Motor.**—Dynamo or motor brushes formed of wire gauze, or of bundles of parallel plates of thin woven wire.

**Gear Clutch Arc-Lamp.**—An arc-lamp provided with a gear clutch.

**Gearless Car Motor.**—A motor whose speed is such as to permit it to be con-

ected directly, without intermediate gearing, on the car-wheel axle.

**Geissler Mercurial Pump.**—A mercurial air pump in which the exhaustion is obtained by the aid of a Torricellian vacuum.

**Geissler Tubes.**—Glass tubes, provided with platinum electrodes passed through and fused into the glass, containing the residual atmospheres of gases at a comparatively low vacuum, either with or without fluorescent liquids or solids, or both, employed to obtain various luminous effects on the passage of electric discharges.

**General Alternating-Current Transformer.**—Any form of alternating-current apparatus in which secondary currents are induced, such as an induction motor or induction generator, as well the ordinary transformer.

**General Faradization.**—A method of employing the faradic current similar to its use in general galvanization.

**General Galvanization.**—A method of employing an electric current therapeutically by the use of electrodes of sufficient size to direct the current practically through the entire body.

**Generator.**—A dynamo-electric machine.

**Generator Ammeter.**—An ammeter measuring the total current output of a generator.

**Generator Bus-Bars.**—The bus-bars which receive the total generated pressure of a number of dynamos, or of a station.

**Generator Panels of Switchboard.**—That panel or set of panels of a central-station switchboard which contains the generator bus-bars, and supports the generator ammeters, voltmeters and switches.

**Generator Switch.**—A switch provided for the purpose of connecting or disconnecting a generator from the bus-bars.

**Generator Unit.**—(1) A dynamo-electric generator in a central station. (2) One of a number of independent generating machines in a central station.

**Generator Voltmeter.** A voltmeter connected with the circuit of a generator, and employed to measure its pressure.

**Geographical Equator.**—The great circle of the earth midway between its poles.

**Geographical Meridian.**—Any great circle of the earth passing through its poles.

**Geomantic Lines of Force.**—The lines of the earth's magnetic force. (Not in general use.)

**German-Silver Alloy.**—An alloy, employed for the wires of resistance coils, usually consisting of fifty parts of copper, twenty-five of zinc and twenty-five of nickel.

**Gig, Electric.**—An electrically propelled rig.

**Gilb.**—A name proposed for the gilbert.

**Gilbert.**—(1) A name proposed for the C. G. S. unit of magnetomotive force. (2) A unit of magnetomotive force equal to that produced by  $\frac{1}{1000}$  of one ampere-turn.

**Gilbertage.**—The value of the magnetomotive force of a circuit expressed in gilberts.

**Gilding, Electric.**—Electro-plating with gold.

**Gilt Plumbago.**—Powdered plumbago whose conducting power for electricity has been increased by electro-plating it with gold, used for rendering non-conducting surfaces electrically conducting.

**Gimbals.**—Concentric rings of brass, suspended on pivots in a compass box, on which the compass is so supported, as to enable it to remain horizontal notwithstanding the movements of the ship.

**Girdor Armature.**—An armature with an H- or girder-shaped core.

**Girder Joint for Rail Bond.**—A name given to a joint in steel rails consisting of two side-clamped girders supporting a tee-bar and double clamped.

**Glass-Bead Hydrometer.**—A bead areometer.

**Glass Fuse.**—A fuse contained in a glass tube with metallic ends.

**Glass Screw Insulator.**—A glass insulator provided with an inside screw thread for attachment to the insulator pin.

**Globe Holder for Arc-Lamp.**—A support provided for holding the globe of an arc-lamp.

**Globe Net for Arc-Lamp.**—A thin wire netting placed on the outside of an arc-light globe.

**Globe Strain-Insulators.**—Insulators provided for the support of the strain wires in an overhead trolley system.

**Globular Lightning.**—A rare form of lightning in which a globe of fire appears quietly floating in the air for a while and then explodes with great violence.



**Globular Spark.**—An experimentally produced globular discharge obtained from a large condenser.

**Glow Discharge.**—A form of convective discharge.

**Glow Illumination.**—(1) A term proposed for an illumination similar to that of a glow-worm; that is, luminous radiation unaccompanied by non-luminous radiation. (2) A term sometimes used for illumination by incandescent electric lamps.

**Glow-Lamp, Electric.**—(1) A lamp whose light is produced by glow illumination. (2) A term sometimes used for incandescent lamps.

**Glow-Worm Radiation.**—(1) The radiation of the glow-worm or fire-fly. (2) Radiation that is practically confined within the limits of the visible spectrum.

**Glowing of Electric Conductor.**—The incandescence of an electric conductor.

**Glue-Pot, Electric.**—An electrically heated glue-pot.

**Glyphography.**—The art of forming an electro-type block, whose impressions will produce relief outlines on a flat surface, by covering a flat copper plate with a suitable insulating material, cutting through the same until the copper is exposed, and then coating the surface with plumbago and electro-plating.

**Gnomon, Electric.**—A term formerly applied to a variety of pith-ball electrometer.

**Gold Bath.**—An electrolytic bath consisting of a readily electrolyzable solution of a gold salt, a gold plate acting as the anode and placed in the liquid opposite the object to be electroplated, which forms the cathode.

**Gold-Leaf Electroscope.**—An electroscope in which a pair of leaves of beaten gold is employed to detect the presence of an electric charge, or to determine its character, whether positive or negative.

**Gold-Plating.**—Electroplating with gold.

**Gong Signalling for Railroads.**—A system of railroad signals employing a code dependent on the sounds produced by gongs.

**Good Earth.**—(1) Total or dead-earth. (2) An earth connection whose resistance is negligibly small.

**Goose-Neck Double-Pull-Off.**—An insulator with a support shaped like a goose neck provided with two points for the attachment of the strain wires and em-

ployed on curves to hold the trolley wire in position.

**Goose-Neck Pull-Off.**—An insulator, with a support shaped like a goose neck, employed on curves to hold the trolley wire in position, and provided with a single point for the attachment of the strain wire.

**Governor, Electric.**—A device for electrically controlling the speed of a steam engine, the direction of a current in a plating bath, the speed of an electric motor, the resistance of an electric circuit, the flow of a liquid or gas into or from a containing vessel, or for other similar purposes.

**Graded Cycle-Magnetization.**—A regularly expanding or contracting cyclic magnetization.

**Graded Winding of Galvanometer.**—A galvanometer winding composed of more than one size of insulated wire provided with a view to increasing the sensibility of the galvanometer, and in which the finest wire is placed nearest the axis of the coil.

**Gradient.**—(1) The increase or decrease of an elevation or quantity with reference to some constant quantity. (2) The space-rate-of-change in a quantity.

**Gradient, Electric.**—(1) The rapidity of increase or decrease of the strength of an electromotive force or current. (2) The vector space-rate of descent of electric potential at any point.

**Graduators.**—Devices, generally electromagnetic, employed in systems of simultaneous telegraphic and telephonic transmission over the same wire, so inserted in the line circuit as to gradually obtain the makes and breaks required in a system of telegraphic communication, so that they fail sensibly to influence the diaphragm of a telephone placed in the same circuit.

**Gramme.**—(1) A unit of mass equal to 15.43235 grains. (2) The mass of a cubic centimetre of water at the temperature of its maximum density.

**Gramme Armature-Winding.**—The winding originally employed by Gramme on the armature of his dynamo-electric machine.

**Gramme Atom.**—Such a number of grammes of any elementary substance as is numerically equal to the atomic weight of that substance.

**Gramme-Calorie.**—(1) The amount of heat required to raise a gramme of water one degree centigrade. (2) The gramme-degree-Centigrade.



**Gramme Equivalent.**—Such a number of grammes of any substance as is numerically equal to the electro-chemical equivalent of that substance.

**Gramme Molecule.**—A weight of any substance, taken in grammes, numerically equal to its molecular weight.

**Gramme-Ring Transformer.**—(1) A transformer whose primary and secondary coils are placed on a closed iron ring. (2) A transformer resembling a Gramme-ring armature.

**Gramophone.**—An apparatus for recording and reproducing articulate speech.

**Gramophone Record.** A record of articulate speech obtained by means of a gramophone.

**Granular-Carbon Telephone-Transmitter.**—A dust telephone transmitter.

**Granular Telephone.**—A word sometimes used for a granular carbon telephone transmitter.

**Graphite.**—A variety of soft carbon suitable for writing on paper or on similar surfaces.

**Grapple Toes.**—The prongs of a grapple employed in grappling for a submarine cable.

**Graphophone.**—A form of apparatus for recording and reproducing articulate speech.

**Graphophone Record.**—A record of articulate speech received on a graphophone.

**Grappling.**—Recovering a sunken object, such as a cable, by means of a grapple.

**Grapple.**—A device for hooking and recovering a submerged object, such as a cable.

**Gratings.**—A plate of glass or metal covered with closely-ruled, parallel lines, employed for obtaining diffraction spectra.

**Gravitation.**—Mutual attraction produced between two masses of matter by the force of gravity.

**Gravity.**—The force which causes masses of matter to move or to tend to move towards one another.

**Gravity Ammeter.**—A form of ammeter in which the magnetic needle is moved against the force of gravity by the magnetic influence of the current it is measuring.

**Gravity Annunciator-Drop.**—An annunciator drop which is operated by gravity under the influence of an electric current.

**Gravity-Drop Annunciator.**—An annunciator whose signals are operated by the fall of a drop.

**Gravity-Feed Arc-Lamp.**—An arc-lamp in which the upper or positive carbon is fed, or permitted to drop towards the negative carbon under the influence of gravity, on the operation of the feeding mechanism.

**Gravity Needle-Drop.**—A needle annunciator furnished with a gravity drop.

**Gravity Voltaic Cell.**—A blue-stone gravity cell.

**Gravity Voltmeter.**—A form of voltmeter in which the potential difference is measured by the movement of a magnetic needle against the pull of a weight.

**Grease-Spot Photometer.**—(1) A translucent-disc photometer. (2) A Bunsen photometer.

**Greater Calorie.**—The amount of heat required to raise the temperature of one kilogramme of water from 0° Centigrade to 1° Centigrade.

**Green Candle.**—A standard candle employed in connection with a screen of green glass in order more readily to compare the light of an arc with that of a standard candle.

**Grenet Voltaic Cell.**—A name sometimes given to the bichromate cell.

**Grid Indicator.**—(1) In telephony, a clearing indicator in which the armature is painted with alternate white and black horizontal stripes and fronted by a brass grid. (2) A form of telephone visual clearing indicator.

**Grid.**—(1) A lead plate provided with perforations or other irregularities of surface, and employed in storage cells for the support of the active material. (2) The support provided for the active material on the plate of a secondary or storage cell.

**Grid Plugs.**—Plugs of active material, or of material that is readily rendered active by a charging current, inserted in the perforations of a grid for the purpose of decreasing the time required for the forming of the plates of a storage cell.

**Grip of Belt.**—The hold of a belt on the driving pulley.

**Grothuss' Hypothesis.**—A hypothesis proposed to account for the electrolytic phenomena that occur on closing the circuit of a voltaic cell.

**Ground.**—A general term for the earth when employed as a return conductor.

**Ground Circuit.**—A circuit in which the ground forms part of the path through which the current passes.

**Ground Coil.**—A small rheostat employed in duplex telegraphy at the home station, for the purpose of obtaining the balance of the line at that station.

**Ground Detector.**—(1) In a system of incandescent-lamp distribution, a device placed in a central station for indicating, by the brightness of a lamp, the existence of a ground on the system. (2) An instrument for detecting or measuring grounds or leaks.

**Ground Indicator.**—(1) A tell-tale device employed on a line carrying a current, to instantly indicate any fault in the insulation. (2) An apparatus for detecting a loss of insulation.

**Ground Plate of Lightning Arrestor.**—That plate of a lightning arrestor which is connected to the ground or earth.

**Ground-Return.**—(1) A general term used to indicate the use of the ground or earth for part of an electric circuit. (2) The earth or ground which forms part of the return path of an electric circuit.

**Ground Shield of Transformer.**—(1) A metallic plate or shield in a transformer separating the primary and secondary coils and connected to ground so as to protect the secondary circuit from any possibility of becoming crossed with the primary. (2) A cylinder of slotted copper placed between the primary and secondary windings of a transformer, so that there can be no accidental contact between the high pressure and the low pressure circuits.

**Ground Wire.** The wire or conductor leading to or connected with the ground or earth in a grounded circuit.

**Grounded Circuit.**—A circuit, part of whose path is completed through the ground.

**Grounded Dynamo.**—A dynamo whose circuit is accidentally or intentionally grounded.

**Grounding.**—(1) A word sometimes employed in electro-metallurgy for the preparatory process of burnishing. (2) Connecting a circuit to earth or ground.

**Group Incandescent Switch.**—A switch which governs a portion or group of the lamps on an electrolytic, or in a room.

**Grouping System for Switchboard Circuits.**—A system of central-telephone-station distribution in which the subscribers are divided into a convenient

number of groups, and each group given to the charge of a single operator.

**Growth of Lines of Force.**—The expansion of lines of force.

**Grove's Voltaic Cell.**—A zinc-platinum couple immersed respectively in electrolytes of sulphuric and nitric acid.

**Guard Arm.**—In telegraphic pole-setting, a short upright secured to a pole cross-arm so as to catch a wire should it become detached from the pole.

**Guard Ring of Electrometer or Condenser.**—A conducting ring constructed to form the annular extension of a plate or disc in an air-condenser, for the purpose of preventing any disturbance of electric flux-distribution at the edge of such disc or plate.

**Guard Suspension Wire.** In a trolley system, a wire supported on the tops of opposite poles for the suspension of a running guard wire, or guard wires.

**Guard Wire.**—A wire hung above any active conductor, such as a trolley wire, in order to prevent it from coming into electric contact with falling wires.

**Guard-Wire Hanger.**—A hanger employed for the suspension of a guard wire.

**Gutta-Percha.**—A resinous gum obtained from a tropical tree, and valuable electrically for its high insulating powers and for its indestructibility when employed in submarine cables.

**Gutter of Insulator.**—A channel on the side of an insulator, designed to carry off the rain water.

**Guy.**—A rod, chain, rope or wire employed for supporting or stiffening any structure such as a telegraph pole.

**Guy-Rod Bands.**—Bands by which a guy-rod is fastened to a pole.

**Guy Rods.** Metallic rods employed as guys.

**Guy Rope.**—A rope employed as a guy.

**Guy Stubs.**—(1) A stub or anchor to which a guy is secured. (2) The stub of a pole set in the earth at an angle away from the pole to be guyed.

**Guy Wire.**—A wire employed as a guy.

**Guying.**—Stiffening by means of guys.

**Guys.**—Stays, suitably secured to a post or anchor, for the purpose of steadying an overhead wire system.

**Gymnoticus Electricus.**—The electric eel.

**Gyration.**—The act of turning around an axis.

**Gyrometer.**—A rotary speed-indicator.

**Gyroscope, Electric.**—A gyroscope driven by an electro-magnetic motor.

**Gyrostal.**—(1) A revolving flywheel designed to display gyrostatic action. (2) A flywheel possessing considerable moment of inertia, suitably supported on pivots within a case, so as to permit of being carried about, and employed to show the

resistance which rotating bodies offer to changing their plane of rotation.

**Gyrostatic Action of Dynamo on Ship-board.**—The action which occurs at the bearings of a dynamo running on board a tossing ship, whereby gyrostatic stresses are produced.

## H

**H.**—A symbol for the horizontal intensity of the earth's magnetism.

**H.**—A contraction for the henry or practical unit of self induction.

**H.**—A contraction for the magnetizing force that exists at any point; or, generally, for the intensity of magnetic force.

**H.**—A symbol for field intensity.

**H.**—A symbol proposed for magnetizing force. (Partly international usage.)

**h.**—An abbreviation for hour, a practical unit of time.

**"H. B." Curves.**—(1) Curves indicating the relations between magnetizing force and magnetic flux density in a magnetic substance. (2) A term sometimes employed for magnetization curves.

**H.P. or H.**—A contraction for horse-power.

**H.R.**—A contraction for high resistance.

**H-Armature Core.**—(1) An armature core in the shape of the letter H. (2) A girder, shuttle, or I-armature.

**H-Poles.**—In telegraphy a pair of parallel vertical poles braced together to form one structure, resembling the letter H.

**Hematoent, Electric.**—An electrically driven device for separating the white blood corpuscles from the red corpuscles by centrifugal force.

**Half-Deflection Method.**—A method of measuring an electromotive force, current or resistance, by adjusting the circuit in such a way as to halve the galvanometer deflection.

**Half-Gate.**—The condition of a turbine when operating with the gate half open.

**Half-Hoop Magnet.**—A magnet in the form of a semi-circle.

**Half-Load Efficiency.**—The efficiency which a device possesses at half its full load.

**Half-Shade for Incandescent Lamp.**—A reflecting shade whose outline conforms

to that of the lamp chamber, and covers but half of its surface.

**Half-Wire Guard for Incandescent Lamp.**—A wire guard which covers but half of an incandescent lamp.

**Hall Effect.**—A transverse electromotive force produced by a magnetic field in substances undergoing electric displacement.

**Halleyan Lines.**—A term sometimes used for isogonic lines.

**Halpine-Savage Torpedo.**—A form of torpedo in which electricity is both the propelling and the directing power, and in which the electric source furnishing the propelling current is contained within the torpedo.

**Hand-Brake Mechanism.**—A car brake operated by hand.

**Hand Dynamo Machines.**—A hand generator.

**Hand Generator.**—(1) A hand-driven dynamo. (2) A hand driven telephone magnet generator.

**Hand-Hole of Conduit.**—A box or opening, communicating with an underground cable, provided for readily tapping the cable, and of sufficient size to permit the introduction of the hand.

**Hand-Lighting Electric Burner.**—A name sometimes applied to a plain pen-dant burner.

**Hand-Operated Alarm.**—Any electric alarm operated by hand, as distinguished from an automatically operated electric alarm.

**Hand Regulation.**—Any regulation of a dynamo effected by the hand, in contradistinction to automatic regulation, such as will preserve constant either the current or the potential.

**Hand Regulator.**—A resistance box, whose separate coils can be readily placed in or removed from the circuit by means of a hand-operated switch.

**Hand Scratch-Brush.**—A scratch brush



operated by hand, as distinguished from one operated by means of a lathe.

**Hand-Signalling.**—Telegraphic signalling by hand, as distinguished from automatic or machine signalling.

**Hand Telegraphic Transmission.**—Manual telegraphic transmission.

**Hand Telephone.**—(1) A telephone receiver held in the hand, as distinguished from a head telephone receiver. (2) An ordinary telephone receiver.

**Hanger Board.**—A form of board provided for the ready replacement or removal of an arc-lamp from a circuit.

**Hanger Cut-Out.**—A cut-out switch for an arc lamp placed under a hanger.

**Hard-Drawn Copper Wire.**—(1) Copper wire that is hardened by being drawn three or four times without annealing. (2) Copper wire not annealed after leaving the die.

**Hard Porous Cell.**—A hard-baked porous cell, whose use in a voltaic cell renders its resistance comparatively high, but which is better able to stand the disintegrating action arising from the crystallization of saline substances present in the battery.

**Hardening.**—Increasing the hardness of certain metals by heating them to a high temperature and then suddenly cooling.

**Hardness.**—That property of a body in virtue of which it resists scratching or cutting.

**Harmonic Analyzer.**—(1) A device for automatically resolving a complex harmonic into its simple-harmonic components. (2) A harmonic receiver. (3) A receiving instrument responding to a single harmonic frequency and which selects that frequency from a complex-harmonic current.

**Harmonic Capacity.**—The capacity of a condenser to a charge or current received from a harmonically varying E. M. F.

**Harmonic Currents.**—(1) Periodically alternating currents varying harmonically. (2) Currents which are harmonic functions of time. (3) Sinusoidal currents.

**Harmonic Electromotive Forces.**—(1) Periodically alternating E. M. F.'s varying harmonically; or harmonic functions of time. (2) Sinusoidal E. M. F.'s.

**Harmonic Frequencies.**—A series of frequencies whose values are integral multiples of the frequency of their fundamental.

**Harmonic Motion.**—(1) Simple-harmonic motion. (2) Simple-periodic motion.

**Harmonic Receiver.**—(1) The receiver employed in systems of harmonic telegraphy, consisting of an electro-magnetic rod tuned to vibrate to a single note or rate only. (2) A receiver designed to respond to a single harmonic frequency in a complex-harmonic current.

**Harmonic Telegraph.**—A general term embracing the apparatus employed in harmonic telegraphy.

**Harmonic Telegraphy.**—(1) A system for the simultaneous transmission of a number of separate and distinct musical sounds over a single wire, employed for simultaneously transmitting an equal number of telegraphic messages. (2) A system of telegraphy employing harmonic currents.

**Harmonic Vibrations.**—The over-tones or higher vibrations into which a complex-periodic vibration may be resolved.

**Harmonics.**—The higher component tones into which any complex tone can be resolved.

**Harmonics, Electric.**—Currents of higher frequencies into which any complex-harmonic current may be resolved.

**Harmonics of Current.**—The harmonic currents into which a complex-harmonic current may be resolved.

**Harmonics of Sound Waves.**—The over-tones or harmonics into which any complex tone may be resolved.

**Harmonograph.**—A mechanical device for compounding any number of simple-harmonic motions of different amplitudes and phases.

**Harness.**—(1) The head and breast equipment of an exchange operator. (2) A term used by telephonists.

**Harpoon, Electric.**—A harpoon containing a bomb that is electrically fired or exploded by the harpooner after the imbedding of the harpoon.

**Harveyizing.**—A method of superficially hardening a steel plate.

**Haulage, Electric.**—Locomotion of a vessel or car by the agency of electricity.

**Head-Bath, Electric.**—A variety of electric breeze applied therapeutically to the head of a patient.

**Head-Gear Telephone.**—A telephone receiver held to the ear by means of a suitable head supporting gear, thus leaving the hands of the operator free.

**Head-Board of Dynamo.**—An insulating board of a dynamo-electric machine for the reception of terminals or switches.

**Head-Board of Motor.**—A switchboard



connected with a motor for use in starting it.

**Head Guy.**—A guy attached to the top of a pole.

**Head Guying.**—A method of pole guying for checking lateral vibrations, in which the top of each pole is guyed to the bottom of the next succeeding pole for a distance of several poles.

**Head-Lamp.**—An electric lamp placed in the focus of a reflector supported on the head.

**Head-Light, Electric.**—An electric light placed in the focus of a parabolic reflector in front of an engine or car.

**Head of Liquid.**—(1) The vertical distance from the level of a liquid in a containing vessel to the centre of gravity of an orifice placed therein. (2) Difference of liquid elevation or level.

**Head Receiver.**—A head-gear telephone-receiver.

**Hearing Tubes.**—Tubes connecting a telephone receiver with the ears of the listener.

**Heat.**—(1) A form of energy. (2) A mode of motion. (3) A vibratory motion impressed on the molecules of matter by the action of any form of energy. (4) A wave motion impressed on the universal ether by the action of some form of energy.

**Heat Alarm.**—A temperature alarm.

**Heat Coil.**—(1) A form of protector for switchboards or receptive apparatus generally, consisting of a coil of fine German silver wire wrapped around a small metallic plug, held in its place by a drop of readily fusible solder, and so arranged that on the melting of the solder a spring is permitted to act so as to dead-ground the system. (2) A form of sneak-current arrester.

**Heat, Electric.**—The heat developed by the passage of an electric current through a conductor.

**Heat Insulator.**—Any non-conductor of heat.

**Heat Lightning.**—A variety of lightning flash unaccompanied by audible thunder, in which the discharge lights up the surfaces of neighboring clouds.

**Heat Unit.**—(1) The quantity of heat required to raise a given mass of water through one degree of the thermometric scale. (2) The calorie.

**Heat Units.**—Units based on the quantity of heat required to raise a given mass of a substance, generally water, through one degree of the thermometric scale.

**Heater, Electric.**—A device for the conversion of electricity into heat, employed for purposes of artificial heating.

**Heating Effects of Current.**—The heat generated by the passage of an electric current through any circuit.

**Heavy Escape.** A term employed for a rapid loss of current on a telegraphic line, due to its accidental connection with the ground, as distinguished from a slight loss of current.

**Hedgehog Transformer or Converter.** A name applied to a particular form of open-circuited iron-core transformer, in which a core of iron wire projects divergently from each end of the coil.

**Heeling Error of Compass Needle.**—The error in a ship's compass needle due to the induced and permanent magnetism of the ship in a vertical plane, which produces no influence upon the needle until the ship heels over, either under a press of canvas, or from any other cause.

**Hefner-Alteneck Amyl-Acetate Standard.**—(1) The amyl-acetate standard of luminous intensity. (2) A standard lamp of definite dimensions consuming amyl-acetate.

**Hefner-Alteneck Amyl-Acetate Lamp.**—The lamp employed in the Hefner-Alteneck amyl-acetate standard.

**Heilmann Locomotive.**—An electrically propelled locomotive which carries not only the steam plant necessary for the operation of the dynamo that furnishes its driving current, but also the motor propelling the truck.

**Hekto.**—A prefix for one hundred.

**Hekto-Ampere.**—One hundred amperes.

**Hekto-Ampere Balance.**—A balance form of ammeter measuring hundreds of amperes.

**Hekto-Watt Hour.**—(1) One hundred watt-hours. (2) A unit of work equal to one hundred watt-hours.

**Helical Coil.**—A wire coil containing a number of convolutions or spirals.

**Heliograph.**—(1) An instrument for telegraphic communication, that operates by employing flashes of sunlight to represent the dots and dashes of the Morse alphabet. (2) A portable instrument for visual telegraphic communication consisting essentially of a mirror supported so as to reflect a beam of sunlight to the distant station, and means to intercept the beam at intervals corresponding to Morse code signals.

**Heliographic Transmission.**—A system

of telegraphic communication employing the heliograph.

**Heliography.**—(1) A description of the sun. (2) A term sometimes applied to the fixing of images in the camera obscura. (3) Transmitting or receiving telegraphic signals by means of the heliograph.

**Heliostat.**—A mirror mounted on an axis parallel to the axis of the earth and so rotated by clock-work as to keep a beam of light reflected from its surface in a constant position, notwithstanding the rotation of the earth.

**Heliotropism.**—A bending and twisting action produced on the growth of stalks and stems by their exposure to any source of light.

**Helix.**—A word sometimes used in place of coil or solenoid.

**Helm Indicator.**—An electrical indicator on board ship for indicating the position at which the helm or rudder stands.

**Helmholtz's Galvanometer.**—A double-ring tangent-galvanometer, whose two ring coils are parallel to each other, and so placed on opposite sides of the magnetic needle that their magnetic field at the needle may be as nearly uniform as possible, and much more nearly uniform than a single-coil ring can produce.

**Hemihedral Crystal.**—A crystal whose shape or form has been modified by the replacement of half of its edges or solid angles.

**Hemispherical Pole-Pieces.**—Pole-pieces of a dynamo-electric machine that provide between them a spherical space for the revolution of an armature.

**Hen.**—A word proposed for henry. (Not in use.)

**Henley's Quadrant Electroscope.**—A form of swinging-pendulum electroscope formerly employed for indicating powerful charges of electricity.

**Henry.**—(1) The practical unit of self-induction. (2) An earth-quadrant, or 10° centimetres.

**Henry's Coils.**—A number of separate induction coils so connected that the currents induced in the secondary of the first coil, induce currents in the secondary of the second coil with whose primary it is connected in series, and so on throughout all the coils.

**Heptad Atom.**—An atom whose valency, atomity, or combining power, is seven.

**Hercules' Stone.**—A name given by the ancients to the holystone.

**Hermetical Seal.**—A seal obtained in a

glass vessel by the fusion of its sides so as to enable it to hold either a vacuum or a pressure greater or less than that of the atmospheric pressure.

**Hertzian Waves.**—(1) Electromagnetic waves given off by an electromagnet whose intensity is undergoing rapid periodic variations, or by a current whose strength is undergoing rapid periodic variations. (2) Electromagnetic waves given off from a circuit through which an oscillatory discharge is passing.

**Hertz's Axial Oscillator.**—A term sometimes employed for Hertz's linear oscillator.

**Hertz's Linear Oscillator.**—A form of Hertz's oscillator in which a straight linear conductor is employed instead of a plate as in the ordinary oscillator.

**Hertz's Oscillator.**—A term sometimes employed for two insulated metal plates to which are attached metal rods, terminated by rounded points or knobs, and separated by an air-gap or space through which disruptive discharges pass.

**Hertzian Oscillations.**—Hertzian waves.

**Heterochromatic Photometry.**—(1) Photometric measurements made with the light chosen as a photometric standard emits rays whose frequencies differ from that of the light which is to be measured. (2) Photometry not restricted to light of one color as distinguished from monochromatic photometry.

**Heterogeneous Conductor.**—(1) A conductor which does not possess the same power of electric conduction in all directions. (2) A non-isotropic conductor or non-homogeneous conducting medium.

**Heterogeneous Dielectric.**—A non-homogeneous dielectric, or one which possesses different powers of induction in different directions.

**Heteropolar Dynamo.**—(1) A dynamo whose conductor moves successively past opposite magnet poles. (2) A bipolar or multipolar dynamo, as distinguished from a commutatorless dynamo.

**Heterostatic.**—(1) Inversely electrified. (2) A term employed to distinguish a form of electrometer in which the electrification is measured by determining the mutual influence of the attraction exerted by the charge to be measured, and the attraction of a fixed charge imparted to the instrument by a source independent of the charge to be measured.

**Heterostatic Electrometer.**—(1) An electrometer in which the electrification

to be measured is not the only electrification employed. (2) An electrometer provided with an independent charge.

**Hexad Atom.**—An atom whose valency or atomicity is six.

**Hexode Working.**—A term employed for a six-way mode of working by the Delany synchronous multiplex telegraph.

**Hick's Automatic Button Repeater.**—A manual form of telegraphic repeater.

**High-Admittance Motor.**—An alternating-current induction motor characterized by high admittance.

**High Commutator Bars.**—A term applied to those commutator segments, or parts of commutator segments, which, through less wear, faulty construction, or looseness, are higher than the adjoining segments.

**High-Economy Lamp.**—Any lamp of high efficiency.

**High Frequency.**—Any frequency much higher than that ordinarily employed.

**High-Frequency Currents.**—Currents produced by electromotive forces of high frequency.

**High-Frequency Induction Motor.**—An induction motor operated by high-frequency currents.

**High-Frequency Transformer.**—A transformer suitable for employment in connection with high-frequency electromotive forces or pressures.

**High Insulation.**—An unusually good insulation.

**High-Potential Current.**—A term loosely applied for a current produced by high electromotive forces.

**High-Potential Insulator.**—An insulator suitable for use on high-potential circuits.

**High-Potential Push-Button.**—A push button provided for safe use on a high-pressure system.

**High-Potential Switch.**—A switch suitable for use on high-pressure circuits.

**High-Potential System.**—In the National Electric Code, any pressure of from 300 to 3,000 volts.

**High-Potential Testing Transformer.**—An alternating-current transformer for obtaining from an ordinary alternating-current circuit, a high alternating pressure suitable for testing insulation.

**High-Potential Wires.**—Circuit wires provided with high insulation, and, therefore, suitable for connection with high-potential sources.

**High Resistance.**—A resistance for any circuit or apparatus, much higher than that ordinarily employed on such circuit or apparatus.

**High-Resistance Arrsater.**—A form of lightning arrester consisting of a number of thin metallic plates separated from one another by means of thin sheets of mica, or other refractory insulating substance.

**High-Resistance Magnet.**—A term sometimes used for a long-coil magnet of fine wire, possessing a high electric resistance.

**High-Resistance Telephone.**—A telephone having an unusually high resistance.

**High-Pressure Incandescent Lamp.**—An incandescent lamp provided with long, thin filaments whose electric resistance is high, and which, therefore, requires a comparatively high pressure for its operation.

**High-Reactance Motor.**—An alternating-current induction motor possessing comparatively high primary reactance.

**High-Speed Electric Motor.**—(1) An ordinary electric motor, as distinguished from a motor designed to run at a slow speed. (2) A motor which has its greatest efficiency when running at high speed.

**High-Susceptance Motor.**—An alternating-current motor possessing comparatively high susceptance.

**High-Tension Accumulator.**—An accumulator consisting of a number of series-connected secondary cells.

**High-Tension Bus.**—A bus-bar supplied by a high pressure.

**High-Tension Cable.**—A cable possessing high insulation and, therefore, suitable for bearing high electric pressures.

**High-Tension Circuit.**—A circuit employed in connection with high electric pressures.

**High-Tension Fuse.**—A fuse for igniting an explosive, that is operated by the heating power of an electric discharge of high tension.

**High-Tension Switch.**—A switch suitable for use in high-tension circuits.

**High Vacuum.**—(1) A space from which nearly all traces of air or residual gas have been removed, as distinguished from a low or imperfect vacuum. (2) Such a vacuum that the length of the mean free-path of the molecules of the residual atmosphere is equal to or exceeds the dimensions of the containing vessel. (3) A nearly perfect vacuum.

**High-Voltage Electro-Magnetic Gen-**



- erator.**—An electro-magnetic generator arranged so as to produce a high electro-motive force.
- High-Voltage Incandescent Lamps.**—Incandescent lamps constructed for more than the usual pressure; usually lamps for more than 120 volts.
- Hissing Arc.**—A voltaic arc that emits a hissing sound, due to its carbons being too near together.
- "Hitching Up."**—A term sometimes employed for booming.
- Hittorf Effect.**—The effect produced by a Hittorf tube.
- Hittorf Rays.**—The rays emitted by a Hittorf tube.
- Hittorf Tubes.**—Various forms of high-vacuum tubes employed by Hittorf in his researches in electrical discharges through high vacua.
- Hold-Off Spring.**—A spring which acts to keep one thing away from another, in opposition to some force tending to keep it in contact with such thing.
- Hold-On Spring.**—A spring which acts to keep one thing against or in contact with another, in opposition to some force tending to pull it away from such thing.
- Holder for Incandescent Lamp.**—An incandescent lamp-socket.
- Holder for Safety Fuse.**—A support, generally of porcelain or other infusible material, employed for holding a safety fuse and for catching the metal when fused.
- Holders for Brushes of Dynamo-Electric Machine.**—Devices for holding the collecting brushes of a dynamo-electric machine.
- Holohedral Crystal.**—A crystal whose shape or form has been modified by the replacement of all its edges or solid angles.
- Holophane.**—A form of glass globe or enclosing chamber for a source of light, which has its external surface cast into lenticular ridges for the more general diffusion of the emerging light.
- Holophotometer.**—A photometer based on the employment of a Bunsen screen with a system of mirrors, so combined as to avoid errors due to the movements which the lights undergo while being compared.
- Holtz Influence Machine.**—A particular form of electrostatic influence machine.
- Home Battery.**—The battery in a sending station on a telegraphic line, as distinguished from a distant battery.
- Home Station.**—The near or sending station on a telegraphic line as distinguished from a distant or receiving station.
- Homogeneous Conductor.**—A conductor possessing the same resistivity throughout its length.
- Homogeneous Current-Distribution.**—Such a distribution of current through a conductor in which there is an equal density of current in all parts of a normal cross-section of the conductor.
- Homogeneous Dielectric.**—(1) A dielectric possessing similar properties in all directions. (2) A uniform dielectric.
- Homogeneous Light.**—(1) A light consisting practically of but a single frequency. (2) Monochromatic light.
- Homopolar Dynamo.**—(1) A dynamo whose conductor moves continuously past poles of one polarity only. (2) A commutatorless dynamo. (3) A so-called unipolar dynamo.
- Hood for Arc Lamp.**—A hood provided for the double purpose of protecting the body of an arc lamp from the weather and for throwing its light in a downward direction.
- Hood Suspension for Arc Lamp.**—A suspension of an arc lamp from a hanger, board placed inside a suitably supported hood.
- Hop System of Space Relations.**—A system of space relations, employed by some electrical writers, which follows the hop tendril;  $i \cdot e$ , which considers advance accompanied by left-hand rotation as positive; or that a rotation is positive when accompanied by translation in the manner of a female screw; or, that clockwise rotation is positive when viewed from the front of the clock.
- Horizontal Candle Power.**—(1) The intensity of light emitted by any source in a horizontal direction. (2) The luminous intensity of a source taken in a horizontal direction, as measured in units of luminous intensity.
- Horizontal Component.**—That portion of a force which acts in a horizontal direction.
- Horizontal Component of Earth's Magnetism.**—(1) That portion of the earth's directive force which acts in a horizontal direction. (2) That portion of the earth's magnetic force which acts to produce motion in a compass needle free to move in a horizontal plane only.
- Horizontal Force of Needle.**—The horizontal component of the earth's magnetic force or magnetism.



**Horizontal Intensity of Earth's Magnetism.**—(1) The horizontal component of the earth's magnetic intensity at any point. (2) The earth's horizontal magnetic force upon a unit magnetic pole.

**Horizontal Intensity of Light.**—(1) The intensity of a light measured in a horizontal direction. (2) The flux of a light contained in a small horizontal beam issuing from a source, divided by the solid angle of the beam.

**Horizontal Slit Photometer.**—A form of spectro-photometer whose slit is horizontal, lying in a straight line joining the sources of light.

**Horns of Pole-Pieces of Dynamo.**—(1) The edges or terminals of the pole-pieces of a dynamo towards or from which the armature is carried during its rotation. (2) The following or leading horns of the pole-pieces of a dynamo.

**Horology, Electric.**—That branch of electric science which treats of the application of electricity to the regulation and operation of electric clocks.

**Horse.**—A support for a dynamo-armature in the process of winding it.

**Horseless Carriage.** An automobile carriage.

**Horse-Power.**—(1) A commercial unit of power, activity, or rate-of-doing-work. (2) A rate-of-long-work equal to 33,000 pounds raised one foot-per-minute, or 550 pounds raised one foot-per-second. (3) A rate-of-doing work equal to 4,502 kilograms raised one metre per minute.

**Horse-Power, Electric.**—Such a rate-of-doing electrical work as is equal to 746 watts, or 746 volt-coulombs per second.

**Horse-Power-Hour.**—(1) A unit of work equal to the work done by one horse-power acting for an hour. (2) 1,980,000 foot-pounds.

**Horseshoe Electro-Magnet.**—An electro-magnet whose core has the shape of a horseshoe, or the letter U.

**Horseshoe Magnet.**—A magnetized bar of steel or hardened iron, bent in the form of a horseshoe, or letter U.

**Hot Saint Elmo's Fire.**—A term proposed by Tesla for a form of flaming brush-discharge between the secondary terminals of a high-frequency, high-potential induction coil.

**Hot-Wire Ammeter.**—An ammeter whose readings are based on the expansion of a wire due to an increase of temperature, by the passage through it of the current that is to be measured.

**Hot-Wire Thermometer.**—A thermometer whose indications are dependent on the expansion of a bi-metallic wire or spiral.

**Hot-Wire Voltmeter.**—A voltmeter whose indications are based on the increase in the length of a metallic wire placed in the circuit of the electromotive force that is to be measured.

**Hotel Annunciator.**—An annunciator connected with the different rooms of a hotel.

**House Annunciator.**—An annunciator connected with the different rooms of a house.

**House Mains.**—The conductors connecting the service wires with the street mains, in a system of multiple-incandescent lamp distribution.

**House Regulator.**—An alternating-current apparatus for insertion in the circuit of a group of lamps in a house for the purpose of controlling the candle-power of that group.

**House-Service Conductor.**—In a system of multiple-incandescent lamp distribution, that portion of the service wire which is included between the street mains and the cut-out within the house.

**House Telephone System.**—(1) A domestic telephone system. (2) A system for establishing telegraphic communication between different places in a house.

**House Wiring.**—The wiring in a house for distributing electric currents therein.

**House Wires.**—The circuit wires employed in a house in a system of distribution.

**Howler.**—A term sometimes used for a loud buzzer.

**Hughes' Electro-Magnet.**—(1) An electro-magnet in which a U-shaped permanent magnet is provided with pole-pieces of cast iron on which only are placed the magnetizing coils. (2) A quick-acting electro-magnet whose magnetizing coils are placed on soft-iron pole-pieces that are connected with and form the prolongation of the pole-pieces of a permanent horseshoe magnet.

**Hughes' Induction-Balance.**—An apparatus for the detection of the presence of a metallic conducting substance in the body by the aid of induced electric currents.

**Hughes' Theory of Magnetism.**—A theory proposed to account for the phenomena of magnetism by the presence of originally magnetized particles or molecules.

**Hummer, Electric.**—A word sometimes employed for an electric buzzer.

**Hunning's Transmitter.**—The original form of dust telephone transmitter.

**Hunting of Parallel-Connected Alternators.**—(1) A periodic increase and decrease in the speed of alternators, when running under certain conditions in parallel connection as motors or dynamos. (2) Imperfect synchronous running.

**Hydraulic Gradient.**—(1) The gradient representing the drop of pressure between the surface of a liquid in a containing vessel and a discharging orifice connected therewith. (2) The rate of drop of pressure in a hydraulic system of distribution.

**Hydraulic Power Dynamometer.**—Any dynamometer suitable for measuring hydraulic power.

**Hydraulic Storage.**—A method of storage of energy consisting in forcing water into elevated reservoirs.

**Hydraulic Transmission.**—The transmission of power by means of pipes containing water under pressure.

**Hydraulics.**—That branch of science which treats of the transmission of water through pipes and the apparatus required for raising or moving water.

**Hydro-Carbon Treatment of Filaments.**—Treatment of incandescent lamp filaments by means of the flashing process.

**Hydro-Dynamics.**—That branch of natural philosophy which treats of the conditions of rest and motion in fluid bodies.

**Hydro Electric Bath.**—An electrotherapeutic bath in which one electrode is applied to the metallic lining of the bath tub, and the other to the body of the patient.

**Hydro-Electric Generator.**—A term sometimes used for voltaic battery.

**Hydro-Electric Machine.**—A term sometimes used for a machine in which electricity is developed by the friction of a jet of steam over a water surface.

**Hydro-Electro-Therapeutics.**—Curative processes combining electro-pathic and electro-therapeutic treatment.

**Hydrogen Voltmeter.**—A voltmeter whose indications are based on the quantity of hydrogen evolved under a constant pressure and temperature.

**Hydro-Generator, Electric.**—An apparatus for the electrical development of the nascent hydrogen employed in the electrical rectification of alcohol.

**Hygrometer.**—(1) An apparatus for de-

termining the specific gravity of liquids. (2) An aneroid.

**Hydrometric Telegraph.**—A form of instrument by means of which signals are transmitted by means of water pressure.

**Hydro-Plastics.**—The art of electrically shaping or depositing metals in the wet by electro-plating.

**Hydro-Plasty.**—The art of hydro-plastics.

**Hydro-Platinum Rheostat.**—A variable rheostat furnished with platinum electrodes.

**Hydrostatic Wire-Testing Machine.**—A machine, operated by hydraulic pressure, for testing the tensile strength of wires.

**Hydrotasimeter, Electric.**—An electrically operated apparatus designed to show at a distance the exact position of any water level.

**Hydrometer.**—An apparatus for determining the amount of moisture present in the atmosphere.

**Hydrometrical.**—Of or pertaining to a hygrometer.

**Hydrometrically.**—In the manner of a hygrometer.

**Hyperphosphorescence.**—(1) A term applied to a variety of phosphorescence which, after due stimulus, the body exhibits a persistent emission of invisible rays, not included in the hitherto recognized spectrum. (2) A phosphorescence accompanied by the emission of the Besquerel rays.

**Hypothesis.**—A provisional assumption of facts or causes, the real nature of which is still unknown, for the purpose of stating their effects.

**Hypothetical.**—Of or pertaining to a hypothesis.

**Hypsometer.**—(1) An apparatus for determining the height of a mountain or other elevation by ascertaining the temperature at which water boils on such elevation. (2) A hydro-barometer.

**Hypsometrical.**—Of or pertaining to a hypsometer.

**Hypsometrically.**—In the manner of a hypsometer.

**Hysteresial Dissipation of Energy.**—The dissipation of energy by means of hysteresis.

**Hysteresis.**—(1) A lagging behind of magnetization relatively to magnetizing force. (2) Apparent molecular inertia due to magnetic changes of stress. (3) A retardation of the magnetizing or demagnetizing effects as regards the rate

which produce them. (4) That quality of a paramagnetic substance by virtue of which energy is dissipated on the reversal of its magnetization.

**Hysteresis Coefficient.**—(1) The hysteresis coefficient. (2) The energy dissipated in a cubic centimetre of magnetic material by a single cyclic reversal of unit magnetic density.

**Hysteresis Conductance.**—The effective conductance in a transformer or condenser due to the effects of hysteresis.

**Hysteretic Constant.**—The hysteretic coefficient.

**Hysteresis Loop.**—The looped curve which forms the outlines of the graphically represented hysteretic cycle to rectangular co-ordinates of magnetizing force and magnetic intensity or magnetization. (2) A cyclic magnetization curve, forming a closed loop.

**Hysteresis Losses.**—Losses of useful energy due to hysteresis.

**Hysteresis Measurer.**—An apparatus for conveniently estimating or measuring the hysteretic coefficient of a magnetic material.

**Hysteresis Meter.**—A hysteresis measurer.

**Hysteresis Tester.**—A hysteresis measurer.

**Hysteretic Activity.**—Activity expended in producing hysteretic effects.

**Hysteretic Coefficient.**—The activity in watts which would be expended in one cubic centimetre of a metal when magnetized and demagnetized to a flux density of one gauss at one complete cycle or double-reversal per second.

**Hysteretic Condensance.**—In a condenser traversed by an alternating current, the apparent reactance of the condenser, due to or modified by hysteresis.

**Hysteretic Conductance.**—In a condenser traversed by an alternating current, the apparent conductance of the condenser, due to or modified by hysteresis.

**Hysteretic Cycle.**—A cycle of complete magnetization and reversal.

**Hysteretic Energy Current.**—The component of current in phase with the impressed E. M. F. at the primary terminals of a transformer representing the power expended in hysteresis. (2) The energy component of the exciting current of a transformer.

**Hysteretic Energy Electromotive Force.**—The energy component of the E. M. F. of excitation in a transformer.

**Hysteretic Lag.**—The lag in the magnetization of a transformer due to hysteresis.

**Hysteretic Resistance.**—In a condenser traversed by an alternating current, the apparent resistance of the condenser due to or modified by hysteresis.

**Hysteretic Susceptance.**—In a condenser traversed by an alternating current, the apparent susceptance of the condenser, due to or modified by hysteresis.

**Hysteretic Torque.**—That portion of the torque of a dynamo-electric machine due to the influence of hysteresis, whereby mechanical work must be expended in developing hysteretic energy as heat in the iron undergoing magnetic reversal.

# I

**I.**—(1) A symbol for strength of current. (2) A symbol for intensity of magnetization.

**I.**—A symbol for intensity of magnetization. (Partly international usage.)

**I. H. P.**—A contraction for indicated horsepower.

**I. I.**—In telegraphy, a signal serving to separate the text of a message from the signature, or the name of the sender.

**I. R.**—A contraction for India rubber.

**I. R.**—A contraction sometimes employed for the drop in an electric circuit, equal to the product of the current in amperes by the resistance in ohms.

**I. S. W. G.**—A contraction for Imperial standard wire gauge.

**I. W. G.**—A contraction for Indian wire gauge.

**I.<sup>2</sup>R. Activity.**—(1) The activity expended in a circuit, equal to the square of the current strength in amperes by the resistance in ohms. (2) The I.<sup>2</sup>R. activity.

**I.<sup>2</sup>R. Loss.**—(1) The loss of power in any circuit equal to the square of the current in amperes by the resistance in ohms. (2) The I.<sup>2</sup>R. loss.

**I-Armature.**—An I, or H-shaped armature.  
**Ice Clearer for Trolleys.**—A trolley

wheel designed to remove aggregations of ice from a trolley-wire.

**Ideal Solenoid.**—A solenoid consisting of a cylinder built up of a number of true circular currents, all independent of one another, and all of whose faces of like polarity are similarly directed.

**Identical-Electrode Coil.**—A term sometimes employed for a double-fluid voltaic cell, both of whose electrodes are formed of the same metal, and whose electromotive forces are dependent on the collection of unlike ions around such plates.

**Idio-Electrics.**—A term formerly applied to such bodies as amber, resin, or glass, which are readily electrified by friction, and which were then supposed to be electric in themselves. (Obsolete.)

**Idiostatic.**—Possessing one kind of electrification only.

**Idiostatic Electrometer.**—An electrometer in which the electrification is wholly due to the potential difference to be measured, as distinguished from a heterostatic electrometer, in which an auxiliary charge is employed from an independent source.

**Idle Coil.**—(1) Any coil through which for the time no current is passing. (2) Any coil which is not passing through a magnetic field or generating an E. M. F.

**Idle Current.**—A wattless current.

**Idle Current of Alternating-Current Dynamo.**—The wattless current of an alternating-current circuit, as distinguished from the active or working current.

**Idle Plug.**—In a telephone switchboard, a plug not in use.

**Idle Poles.**—Poles or electrodes in Crookes' tubes between which no discharge is taking place.

**Idle Wire.**—(1) Any wire through which either no current at all, or no useful current, is passing. (2) Any open-circuited armature wire not generating an E. M. F.

**Idle-Wire of Armature.**—A term sometimes employed in place of dead wire.

**Idle Wire of Armature of Dynamo.**—(1) That part of the wire on a dynamo armature in which no useful electromotive force is produced. (2) The dead wire of an armature.

**Idle-Wire of Armature of Motor.**—That part of the wire on the armature of a motor in which the field produced by the driving current exercises no useful action in driving the motor, since no counter-electromotive force is generated in it.

**Igniter.**—A carbonaceous material placed between the free ends of a fuelled candle, which becomes incandescent on the passage of the current and so starts the arc to be formed.

**Ignition, Electric.**—The explosion of a powder, or the lighting of a combustible substance, by electrically generated heat.

**Illuminant.**—Any source of light.

**Illuminated.**—A somewhat inelegant or tautology for illuminated.

**Illuminated Dial Instrument.**—An instrument for engineering or astronomical use, provided with a transparent dial illuminated from the back so that the position of the pointer is visible at a great distance.

**Illuminating Power.**—The amount of illumination produced by any luminous source.

**Illumination.**—The quantity of light received on a surface per unit of area, either directly from a luminous source or indirectly by reflection and diffusion from surrounding objects.

**Illumined.**—Lighted up or rendered visible by means of light.

**Illumined-Dial Measuring Instrument.**—A name applied to any optical measuring instrument whose dial is so illuminated that its scale divisions can be readily seen at a distance.

**Illumined Electrode.**—That electrode of a selenium cell which on exposure to light develops an E. M. F.

**Illuminometer.**—An instrument for measuring the illumination of a surface.

**Image.**—The picture of an object formed by rays from its several points, brought or focused by any suitable means, either on the retina, or on a screen, so as to permit the image to become visible.

**Image, Electric.**—(1) A term sometimes applied to the charge produced on a neighboring surface by induction from a known charge. (2) An electrified point, or system of points, on one side of a surface, which would produce on the other side of that surface the same electrical action that the actual electrification of the surface really produces.

**Imbibition Currents.**—Currents produced in tissues by the imbibition or absorption of a fluid.

**Immediate False Zero.**—A term employed in Wheatstone-bridge measurements in an observation made with reference to that position of the galvanometer needle, as zero, which is assumed,



or which tends to be assumed, immediately after the application of the testing E. M. F.

**Immersion Front of Microscopic Object Glass.**—That front of a high-power or immersion objective, to which the object is attached by a drop of transparent liquid.

**Immersion Gilding.**—A gilding or electro-plating obtained by a process of simple immersion in a suitable solution of gold.

**Immersion Objective.**—An object glass of high magnifying power.

**Impact.**—A shock or collision caused by the meeting of two bodies when one or both are in motion.

**Impedance.**—(1) Generally, opposition to current flow. (2) The sum of the ohmic resistance, and the spurious resistance of a circuit, measured in ohms. (3) In a simple-harmonic current circuit the square root of the sum of the squares of the resistance and reactance. (4) The apparent resistance of a circuit containing both resistance and reactance.

**Impedance Circuit.**—A circuit containing impedance.

**Impedance Coils.**—A term sometimes applied to choking coils, reactance coils, or economy coils.

**Impedance Factor.**—The ratio of the impedance of a conductor or circuit to its ohmic resistance.

**Impedance Rush.**—(1) The rush of current produced on closing an inductive circuit. (2) An impulsive current rush.

**Impediment.**—A term proposed for the apparent resistance of a circuit containing resistance, self-induction, and capacity.

**Impenetrability.**—That property which prevents any two particles of matter from occupying the same space at the same time.

**Imperfect Earth.**—Partial earth.

**Imperfect Linkage.**—(1) Magnetic flux linkage between two coils or circuits, such that some linkage of one circuit is not associated with the other circuit. (2) Coils or circuits possessing mutual induction but also possessing magnetic leakage.

**Imperfect Magnetic Circuit.**—A term sometimes employed for a magnetic circuit in which, from the magnetizing coils being placed on one part of the core only, the intensity of the flux is greater through some portions of the ferric circuit than through others, so that some of

the lines of induction complete their circuits by passing through the space surrounding the core instead of through the core itself.

**Impermeability.**—The reciprocal of the permeability.

**Impermeance.**—The reciprocal of the permeance.

**Imponderable.**—(1) Possessing no weight. (2) A term formerly applied to the luminiferous or universal ether.

**Impressed.**—Caused to act or forced upon.

**Impressed Electromotive Force.**—

(1) The electromotive force brought to act in any circuit to produce a current therein. (2) In an alternating-current circuit, the impressed electromotive force due to an impressed source, in contradistinction to the effective electromotive force, or that which is active in producing current, or the electromotive forces due to, or opposed to, self or mutual induction. (3) An applied E. M. F., as distinguished from a resultant, active, or wattless E. M. F.

**Impressed Field.**—An electric or magnetic field brought to bear upon any substance or space as distinguished from secondary fields thereby set up.

**Impressed Pressure.**—The impressed electromotive force.

**Impulse.**—(1) Any single or momentary force acting on a body. (2) The motion produced by a suddenly communicated force.

**Impulse of Couples.**—The product of the magnitude of a couple, and the time it is acting.

**Impulsion Cell.**—A photo-electric cell whose sensitiveness to light may be restored or destroyed by slight impulses given to the plate, either by mechanical blows or taps, or by electro-magnetic impulses.

**Impulsion Effect.**—The restoration or loss of sensitiveness of a photo-electric cell to the action of light, produced by means of an impulse, such as a mechanical tap or blow, or an electro-magnetic impulse.

**Impulsive.**—Communicated by an impulse.

**Impulsive Current-Rush in Inductive Circuit.**—An abnormal rush of current which sometimes occurs when a transformer is suddenly switched on to an active main.

**Impulsive Discharge.**—A discharge produced in conductors by suddenly created differences of potential.

**Impulsive Impedance.**—The impedance encountered by an oscillatory discharge.

**Impulsive Inductance.**—The apparent inductance of a conductor or circuit when subjected to an impulsive discharge.

**Impulsive Permittance.**—The apparent permittance of a conductor or circuit through which an impulsive discharge is passing.

**Impulsive-Rush Discharge.**—An impulsive discharge.

**"In Bridge."**—In multiple to a circuit, as distinguished from being inserted in series with a circuit.

**Inactive Molecules.**—(1) Those molecules of an electrolyte which, during the passage of an electric current, are not resolved into their constituent ions, and which, therefore, have no effect on the molecular conductivity of the electrolyte. (2) The non-dissociated molecules of an electrolyte.

**Incandescence.**—To glow or shine by means of incandescence.

**Incandescence.**—The shining or glowing of a substance, usually a solid, by reason of its elevation to a sufficiently high temperature.

**Incandescence, Electric.**—The shining or glowing of a substance, generally a solid, by means of heat of electric origin.

**Incandescent.**—Shining or glowing with heat.

**Incandescent-Ball Electric Lamp.**—An incandescent electric lamp in which the light is produced by a sphere or ball of carbon placed in an exhausted glass chamber and subjected to electrostatic waves of high frequency.

**Incandescent Bombardment-Lamp.**—An electric lamp in which a refractory material is rendered incandescent by the molecular bombardment produced by the passage of an electric discharge through a rarefied space.

**Incandescent Circuit.**—A circuit provided for the operation of incandescent electric lamps.

**Incandescent-Cut-Out.**—(1) A cut-out suitable for use in an incandescent light circuit. (2) A safety-fuse cut-out.

**Incandescent Filament.**—The incandescing conductor of an incandescent electric lamp, whether of small or of comparatively large cross-section, though generally of the former.

**Incandescent Electric Lamp.**—An electric lamp whose light is produced by the electric incandescence of a strip or fila-

ment of some refractory substance, almost invariably carbon.

**Incandescent Electric Lighting.**—Artificial lighting obtained by means of incandescent electric lamps.

**Incandescent Generator.**—A dynamo-electric machine suitable for operating incandescent lamps.

**Incandescent Lamp.**—An incandescent electric lamp.

**Incandescent Lamp-Base.**—The base of an incandescent electric lamp.

**Incandescent Lamp-Cord.**—A flexible lamp cord containing two separate conductors, suitable for use with a pendant incandescent electric lamp.

**Incandescent Lamp-Shade.**—A shade provided for use in connection with an incandescent electric lamp.

**Incandescent Lamp-Socket.**—A socket provided for the reception of an incandescent lamp.

**Incandescent Lighting.**—Artificial lighting produced by the use of incandescent lamps.

**Incandescent Lighting Dynamo-Electric Machine.**—An incandescent generator.

**Incandescent Mantle-Burner.**—(1) A gauze skeleton, or mantle, employed for artificial illumination, made of refractory materials and rendered incandescent by the heat of a Bunsen flame. (2) The mantle of a Welsbach burner.

**Incandescing.**—Producing light by incandescence.

**Incandescing Filament.**—A lamp filament that is producing light by incandescence.

**Incandescing Lamp.**—(1) An incandescent lamp that is actually producing light. (2) An incandescent lamp emitting light.

**Inclination Chart.**—A map or chart in which the isoclinic lines are marked.

**Inclination Compass.**—(1) A magnetic needle, free to move in a single vertical plane only, and employed for determining the angle of dip at any place. (2) An inclinometer or dipping circle.

**Inclination Magnetometer.**—An inclination compass or inclinometer.

**Inclination Map.**—A map or chart on which isogonal lines, or lines connecting places which have the same magnetic dip or inclination, are drawn.

**Inclination of Magnetic Needle.**—(1) The deviation of a mechanically balanced magnetic needle from a horizontal position. (2) The dip of a magnetic needle.

**Inclinometer.**—An inclination compass.  
(2) A word sometimes used for a dipping circle.

**Incoming Call.**—A call received at an exchange from a subscriber or from another exchange, as distinguished from an outgoing call.

**Incoming Call Trunk Line.** A trunk line entering a central telephone station and employed for the reception of calls, as distinguished from an outgoing call trunk line upon which calls are transmitted.

**Incoming End.**—The end of a junction telephone wire at which calls are received.

**Incoming Junction Board.**—A switchboard at a central exchange at which incoming junction wires are received and distributed.

**Incoming Lines.**—Lines at a telephone exchange at which calls are received, as distinguished from outgoing lines.

**Incoming Signals.**—The signals that are received at the home end of a telegraphic circuit.

**Incoming Wires.**—Wires leading into a building, room, switchboard, or other device.

**Incomplete Circuit.**—An open or broken circuit.

**Inconductivity.**—A word sometimes used for non-conductivity.

**Increased Electric Irritability.**—Irritability of nervous or muscular tissue produced by a much weaker electric current than that required to produce it in normal tissue.

**Increment Key.**—A telegraphic key so connected that an increase or increment in the line current occurs whenever the key is depressed, as distinguished from a key which opens or closes a circuit.

**Increment Key of Quadruplex Telegraphic System.**—A key employed to increase the strength of a current and so operate one of the distant instruments in a quadruplex system, by an increase in the strength of the current.

**Independent Circuits.**—(1) Separate circuits or those which have no electric connection with other circuits. (2) Circuits in electric connection, but acting independently, as though insulated from each other.

**"In-Current" of Telephone Relay.**—The current which is received by a telephone relay, for transmission to another circuit.

**Independent-Diphase System.**—A

phrase sometimes used for the four-wire diphase system.

**Indestructibility of Energy or Matter.**—A theory which assumes that energy or matter can never be destroyed, and that, consequently, when either disappears in one form or phase, it must reappear in some other form or phase.

**Index of Refraction.**—(1) The ratio of the sine of the angle of incidence to the sine of the angle of refraction for the light passing from a vacuum into a material medium. (2) A quantity representing the amount of deviation of a ray of light from its original course, on its passage from a standard medium, or vacuum, to another of different density. (3) A quantity representing the ratio of the velocity of wave-propagation in a vacuum to the velocity in a material medium. (4) In the electro-magnetic theory of light the geometric mean of the specific inductive capacity and the magnetic inductivity of a medium to electro-magnetic waves of a given frequency.

**India Rubber.**—(1) A resinous substance obtained from the milky juices of a tropical tree. (2) Caoutchouc.

**Indicating Bell.**—An electric bell which, in order to distinguish between different bells in the same office, is provided with an annunciator drop which is released by each bell when it rings.

**Indicating-Bell Annunciator.**—An annunciator provided for an indicating bell.

**Indicating Lamp.**—A lamp connected with a circuit, which is lighted or extinguished, or the intensity of whose light is caused to vary, on the occurrence of a predetermined change in the pressure or resistance of the circuit.

**Indicating Push Button.**—A push button which leaves an indication of its having been depressed.

**Indicating Switch.**—A switch provided with an indicator which shows whether the circuit of the switch is closed or open.

**Indicator.**—A term sometimes employed for annunciator.

**Indicator Card.**—The card of a steam-engine indicator, on which are traced the curves of pressure, by means of which the indicated horse-power of the engine may be calculated.

**Indicator Dial, Electric.**—In a system of railway block signalling by electricity, an electro-magnetic indicator having a dial which shows the condition of a section of railway.

**Indicator, Electric.**—(1) A general term



applied to various devices operated by the deflection of a magnetic needle, or the ringing of a bell, or by both, for indicating, at some distant point, the condition of an electric circuit, the strength of current passing through any circuit, the head of water or other liquid, the pressure on a boiler, the temperature, the speed of an engine or lines of shafting, the working of a machine, or other similar events or occurrences. (2) A term sometimes used in place of annunciator. (3) Any electric or magnetic signalling apparatus.

**Indicator Flap.**—A light metal disk or cover, hinged over a self-restoring indicator, in a branching multiple telephone switchboard.

**Indifferent Electrode.**—In electrotherapeutics, the electrode that is employed to merely complete the circuit through the organ or part of the body subjected to the electric current, and not directly concerned in the treatment or diagnosis of the diseased part, and which, therefore, may be located at any convenient point.

**Indifferent Point.**—A point in the intrapolar regions of a nerve, where the anelectrotonic and cathelectrotonic regions meet, and where the excitability is, therefore, unchanged.

**Indirect Distribution.**—A system of electric distribution in which intermediate contrivances for the transformation or accumulation of electric energy are employed between the generator and the receptive devices.

**Indirect Electrolysis.**—Chemical reactions effected as a consequence of electrolytic action, as distinguished from electrolytic actions themselves.

**Indirect Excitation.**—The excitation of a muscle obtained by placing an electrode on its nerve instead of directly on the muscle.

**Indirect Welder.**—A step-down transformer employed in electric welding.

**Individual Electric Motors.**—A term sometimes employed for electric motors that are coupled directly to the shaft of each machine to be driven or operated.

**Individual Signal.**—A selective signal, or one in which a given signal only is sounded at a distant point on a circuit with which more than one signal is connected.

**Individual Signalling Apparatus.**—Signalling apparatus provided with individual signals.

**Individual Telephone Switchboard.**—A single section of a multiple switchboard.

**Individual Transformer.**—A transformer employed solely for the supply of some particular translating device or group of devices, as distinguished from a transformer which supplies a number of circuits or groups.

**"In-Door" Transformer.**—A transformer designed for use inside a building.

**Induced.**—(1) Set up or caused by induction. (2) Not produced by metallic communication.

**Induced Atomic or Molecular Currents.**—Currents supposed to be induced in the atoms or molecules of a magnetizable substance when brought into magnetic flux.

**Induced Circuit.**—An inductive circuit.

**Induced Current.**—A current produced by electrodynamic induction.

**Induced Current of Transformer.**—A term sometimes employed for the secondary current of a transformer.

**Induced Direct-Current.**—(1) The current produced in an active circuit on the breaking of such circuit, having the same direction as the active current and tending to prolong and strengthen it. (2) The break-induced current.

**Induced Electromotive Forces.**—E. M. F.'s set up by electrodynamic induction.

**Induced Electric Surging.**—Electric surging induced in neighboring conductors by means of electric surging oscillatory discharges, or impulsive current rushes in their vicinity.

**Induced Electrostatic Charge.**—A charge produced by bringing a body into an electrostatic field.

**Induced Lightning Discharge.**—(1) A lightning discharge produced in a substance by induction from a neighboring lightning flash. (2) A back or return lightning stroke.

**Induced M. M. F.**—(1) Any magnetomotive force produced by induction. (2) The aligned or structural magnetomotive force, as distinguished from the prime magnetomotive force.

**Induced Magnetic Flux.**—Magnetic flux produced in any body by induction.

**Induced Reverse Currents.**—(1) The currents induced in an active conductor at the moment of making or closing the circuit in the opposite direction to the inducing current, and, therefore, tending to check its flow. (2) The current induced in the secondary on making or breaking the circuit of the primary.



**Induced Spiral or Conductor.**—A term sometimes used for the secondary spiral or conductor of a transformer.

**Inducing.** Producing electromotive forces, currents, or fluxes, by means of induction.

**Inducing Circuit.**—Any circuit which causes induction.

**Inducing Current of Transformer.**—A term sometimes employed for the primary current of a transformer.

**Inducing Magnet.**—The permanent magnet of a relay.

**Inducing Spiral or Conductor.**—A term sometimes used for the primary spiral or conductor of a transformer.

**Inductance.**—(1) The capacity for induction possessed by an active circuit on itself, or on neighboring circuits. (2) Self-induction. (3) That property, in virtue of which a finite electromotive force impressed on a circuit does not immediately generate the full current due to the resistance of the circuit, and which, when the electromotive force is withdrawn, requires a finite time for the current strength to fall to its zero value. (4) A property, by virtue of which the passage of an electric current is necessarily accompanied by the absorption of electric energy in producing a magnetic field. (5) A constant quantity in a circuit at rest, and devoid of iron, depending only upon its geometrical arrangement, and usually expressed in henrys, or in centimetres.

**Inductance Box.** A box containing a number of graded inductances, and employed for the measurement of the inductance of a circuit.

**Inductance Bridge.**—An apparatus similar to a Wheatstone's bridge, for measuring the inductance of a circuit.

**Inductance Coil.**—(1) An impedance, reactance, or choking coil. (2) A coil placed in a circuit, for the purpose of preventing an impulsive current-rush in that circuit, by means of the counter-electromotive force developed in the coil on being magnetized.

**Inductance-Reactance.**—The reactance of a self-inductive coil, as distinguished from the reactance of a condenser, or a capacity-reactance.

**Inductance-Resistance.**—Reactance.

**Inductance Speed.**—(1) A term proposed for the product of the coefficient of self-induction by an angular velocity, corresponding to a simple-harmonic frequency. (2) In an alternating-current circuit, the

product of an inductance and  $2\pi$  times the frequency.

**Inductanceless.**—Devoid of inductance.

**Inductanceless Circuit.**—(1) A circuit practically devoid of inductance. (2) A circuit whose magnetic field is negligible, such, for example, as an ordinary incandescent lamp, or a double-wound resistance coil.

**Inducteous Body.**—A term proposed by Faraday for a body in which a charge is induced by the action of a neighboring charge.

**Induction.**—(1) The influence exerted by a charged body, or by a magnetic field, on neighboring bodies without apparent communication. (2) The influence produced through a dielectric by the action of electrostatic or magnetic flux.

**Induction Alternator.**—A name sometimes given to an inductor alternator.

**Induction Booster.**—An ordinary induction motor whose field coils are in series with the mains, employed in an alternating-current circuit as a booster or feeder regulator.

**Induction Bridge.**—(1) A balance in which electro-magnetically induced currents are equilibrated. (2) An inductance bridge.

**Induction Coil.**—An apparatus consisting of two associated coils of insulated wire employed for the production of currents by mutual induction.

**Induction Factor.**—In an alternating-current circuit the ratio of the wattless component of current to the total current strength.

**Induction-Finder.**—A term sometimes used for a magnetic explorer.

**Induction Flux.**—Total magnetic flux in any portion of a magnetic circuit.

**Induction Generator.**—(1) A generator supplying currents which are received from the line and reinforced within its coils. (2) A generator which operates by induction from currents in a short-circuited armature. (3) An induction-motor driven above synchronism. (4) An alternating-current dynamo itself incapable of generating currents but becoming excited by currents received from the line.

**Induction Killer.**—Any anti-induction device.

**Induction Motor.**—(1) An asynchronous alternating current motor, in which currents are induced in a short-circuited element or armature. (2) A polyphase or uniphase motor operating by the action

of a rotary magnetic field upon a short-circuited armature.

**Induction Multiphase-Motor.**—An alternating-current induction, or asynchronous motor, operated by multiphase currents.

**Induction Plates of Condenser.**—The metallic plates of a condenser on which the charges reside.

**Induction Regulator.**—A term sometimes employed for an alternating-current regulator.

**Induction Resistance.**—An inductive resistance.

**Induction Rotary.**—A term sometimes employed for a rotary converter without field excitation.

**Induction Screen.**—(1) A plate of metal placed between two adjacent electrified bodies, or magnetic coils, for the purpose of preventing or modifying the inductive action they exert on one another. (2) A conducting screen wholly or partially opaque to inductive action.

**Induction Telegraph.**—A general term embracing the apparatus employed in induction telegraphy.

**Induction Telegraphy.**—(1) A system for telegraphing, between moving trains and fixed stations on a railroad, by means of impulses transmitted by induction between the car and a wire parallel with the track. (2) Wireless telegraphy.

**Induction Top.**—A top consisting of a copper disc supported on a vertical axis, which, when spun before the poles of a steel magnet, assumes an inclined position, by reason of the currents produced therein.

**Inductional Igniting Device.**—A device for producing ignition by an induced electric discharge.

**Inductionless.**—Devoid of induction.

**Inductionless Circuit.**—A circuit devoid of induction.

**Inductionless Resistance.**—(1) A resistance devoid of self-induction. (2) A double-wound resistance.

**Inductive.**—Capable of producing induction.

**Inductive Capacity of Line.**—The electrostatic capacity of a line.

**Inductive Circuit.**—Any circuit in which induction occurs.

**Inductive Connection.**—A connection of one circuit with another by means of induction only, as distinguished from metallic connection.

**Inductive Disturbance.**—Any disturb-

ance in the operation of a telephone or telegraph line produced by induction.

**Inductive Electromotive Force.**—An electromotive force produced by induction.

**Inductive Interference.**—Inductive disturbance on a line.

**Inductive Leak.**—A leak containing inductance provided in a cable or circuit as distinguished from a leak containing resistance only.

**Inductive Leakance.**—(1) Leakage taking place through inductive shunts. (2) Leakage artificially produced in a telegraph or telephone circuit through induction coils.

**Inductive Pole.**—An induced pole.

**Inductive Reactance.**—Reactance due to self induction as distinguished from reactance due to a condenser.

**Inductive Retardation.**—A retardation in the appearance of a signal at the distant end of a cable or circuit, produced by the action of induction.

**Inductive Resistance.**—(1) A resistance possessing self-induction. (2) The reactance of a circuit.

**Inductive Resistance Regulator.**—A regulator suitable for altering the impedance of a circuit or conductor by varying its inductance.

**Inductivity.**—(1) A word proposed for specific inductance. (2) Magnetic permeability.

**Inductivity.**—(1) The magnetic permeability of a magnetic medium. (2) The dielectric constant of an electric medium.

**Inductively Associated Circuit.**—A circuit in position of a circuit as regards another circuit, that any electric change in one circuit produces a corresponding change in the other circuit by induction.

**Inductize.**—To subject a body to the effects of induction.

**Inductometer.**—An instrument capable of measuring inductance.

**Inductophone.**—A device for obtaining electric communication between moving trains and fixed stations by means of induction currents.

**Inductor Alternator.**—(1) An inductor dynamo for alternating currents. (2) An alternator in which both armature and field are fixed, but in which a rotating frame is so placed in relation to each to generate E. M. F.'s in conducting loops or coils on the armature.

**Inductor Alternating Generator.**—An alternator in which neither the field coils

nor the armature rotates, but an iron frame rotates in such a manner as to periodically fill and empty the armature loops with magnetic flux.

**Inductor Dynamo.**—(1) A generator in which the field and armature coils are stationary, and the magnetic flux through them is altered by the motion of inductors past them. (2) A dynamo-electric generator in which the differences of potential causing the currents are obtained by magnetic changes in the cores of the armature and field coils by the movements of inductors past them.

**Inductor Generators.**—Inductor alternators or dynamos.

**Inductors of Electrostatic Machine.**—The electrified parts of an electrostatic influence machine, which exert inductive influence.

**Inductors.**—The laminated masses of iron employed in inductor dynamos for the purpose of producing variations in the magnetic flux of the core and armature.

**Inductorium.**—A name sometimes given to an induction coil.

**Inductoscope.**—Any apparatus for detecting the presence of induction between two circuits.

**Inductric.**—Capable of producing induction.

**Inductric Body.**—A term proposed by Faraday for the body containing the inducing electric charge.

**Inefficiency of Incandescent Lamp.**—The number of watts that have to be supplied to an incandescent lamp per candle-power emitted, very commonly, but inaccurately, called the efficiency of the lamp.

**Inertia.**—The inability of a body to change its condition of rest or motion until some force acts on it.

**Inertia, Electric.**—A term sometimes used for electro-magnetic inertia.

**Inertia Factor.**—The factor in a dynamical system in virtue of which the moving system possesses kinetic energy.

**Inferred Zero.**—(1) A zero deduced or inferred from the deflection produced by a charge that is to be measured, by comparison with the value of the deflection obtained by a known charge. (2) A zero on the scale of an instrument, too remote to be mechanically obtainable, but assumed as virtually existing for the purposes of calculation.

**Infinity Plug.**—(1) A plug provided for a hole in a resistance box in which the two pieces of brass the plug connects are not connected by any resistance coil, and

which, therefore, when withdrawn, leaves an open circuit of a practically infinite resistance. (2) A discontinuity plug.

**Inflection.**—The bending by diffraction of rays of light or radiant energy on their passage past a sharp edge.

**Inflexible Conduit System.**—A conduit system which will not permit the introduction or removal of its conductors, after the structure is completed.

**Influence.**—A word sometimes used instead of electrostatic induction.

**Influence Charge.**—A charge produced by electrostatic induction.

**Influence, Electric.**—Electrostatic induction.

**Influence Machine.**—A name sometimes used for an electrostatic-induction machine.

**Infra-Red Frequencies.**—Frequencies lower or smaller in number than those of red light.

**Infra-Red Light.**—A term applied to radiation frequencies below the reds of the spectrum.

**Infra-Red Spectrum.**—That portion of the spectrum which lies below the red, or whose frequencies are smaller than those of the red.

**Initial.**—Placed or occurring at the beginning.

**Initial Magnetisation.**—Magnetization originally produced or imparted.

**Injection of Telegraph Poles.**—Impregnating telegraph poles with any preservative liquid.

**Injector.**—An apparatus for the introduction of a condenser or other device into an electric circuit at a definite moment and for a definite interval of time.

**Inners.**—In telephony, the internal pair of springs of a jack.

**In-Put.**—The power absorbed by any machine in causing it to perform a certain amount of work.

**Inside Box-Brush.**—A brush suitably shaped for polishing the inside of tubular surfaces, for the purpose of cleansing such surfaces so as to prepare them for electroplating.

**Inside Wiring.**—(1) In a system of incandescent lighting, the conductors that lead to the interior of a house or other building to be lighted. (2) Any conductors placed inside a building.

**Inside Work.**—Indoor wiring.

**Insulation, Electric.**—A term sometimes employed for electric sun-stroke or electric prostration.



**Inspection Boxes.**—Man-holes provided for the inspection of electric mains.

**Installation.**—(1) A general term embracing the entire plant and accessories required to perform any specified work. (2) The act of placing, arranging or erecting a plant or apparatus.

**Installation, Electric.**—(1) The establishment of any electric plant. (2) A plant.

**Instantaneous.**—Occurring at an instant.

**Instantaneous-Contact Method.**—A method of determining the form of an alternating-current wave by making contacts with the circuit at definite instants in each cycle.

**Instantaneous Current.**—The current strength taken at any given moment of time.

**Instantaneous Electromotive Force.**—The value of the electromotive force taken at any given instant of time.

**Instantaneous Efficiency of Transformer.**—The efficiency of a transformer taken at any instant of time, as distinguished from its mean efficiency, or its efficiency extending over a fairly considerable time.

**Instantaneous Pressure.**—The instantaneous electromotive force.

**Instantaneous Value of Periodic Current or E. M. F.**—The value of a periodic current or E. M. F. at any given instant of time as distinguished from an average or effective value.

**Instantaneous Values.**—Values measured at a given instant of time, as distinguished from average values.

**Instrument Bars.**—In a multiple telephone switchboard the conducting bars connected to an operator's set.

**Instrument Zero.**—The true zero of an instrument scale, as distinguished from a zero selected at some other point or a false zero.

**Insulate.**—To so insulate a body as to prevent electricity from being conducted to or removed from it.

**Insulated Body.**—A body supported on or surrounded by an insulator, or non-conductor of electricity.

**Insulated Conductors.**—Conducting wires provided with an insulating coating or covering.

**Insulated.**—A term sometimes employed in telegraphy for a free wire, or a wire that is disconnected from its apparatus and left insulated.

**Insulated Pliers.**—A pair of pliers whose

handles are encased in insulating material.

**Insulated Trolley-Crossing.**—A crossing placed at the intersection of two streets where trolley wires cross each other, provided with an insulating material to prevent the contact of the crossing wires.

**Insulated Turn-Buckle.**—(1) A turn-buckle carrying a shackle insulator at one end. (2) A device supported by suitable insulators employed on overhead circuits for straightening the wires by increasing the stress on them.

**Insulated Wires.**—Wires provided with insulating coverings or coatings.

**Insulating.**—Providing with insulation.

**Insulating Bushing.**—A bushing made of insulating material.

**Insulating Cements.**—Various mixtures of gums, resins and other substances possessing the ability not only of binding two or more substances together, but also of electrically insulating them from one another.

**Insulating Coating.**—A coating or covering of insulating material.

**Insulating Covering.**—An insulating coating.

**Insulating Joint.**—A joint in an insulating material or covering in which the continuity of the insulating material is ensured.

**Insulating Sleeve.**—A sleeve formed of insulating material, and provided for covering splices in an insulated conductor.

**Insulating Stool.**—A stool provided with insulating supports of vulcanite, or similar high-insulating substance, employed to afford a convenient insulating stand or support.

**Insulating Tape.**—A ribbon of flexible material impregnated with okouite, rubber, or other similar material, and generally containing some adhesive substance, employed for insulating wires or electric conductors at joints, or other exposed places.

**Insulating Tube.**—(1) A tube of insulating material provided for covering a splice in an insulated conductor. (2) A tube of insulating material provided for slipping over an insulated conductor where it passes through a partition, and employed for preventing the abrasion of the insulating material at that point.

**Insulating Varnish.**—An electric varnish formed of any good insulating material.



**Insulating Washer.**—A washer formed of insulating material.

**Insulation.**—Any medium or material that will prevent a body from gaining or losing light, heat, electricity, etc.

**Insulation Bracket.**—A bracket of insulating material, provided with an insulator.

**Insulation Break-Down.**—Any failure of the insulation which prevents it from insulating.

**Insulation, Electric.**—A non-conducting material so placed with respect to a conductor as to prevent either the loss of its charge, or the leakage of its current.

**Insulation Joint.**—A joint in an insulating material or covering in which continuity is preserved both in the conducting and in the insulating substance.

**Insulation Lightning-Protection.**—The protection of an instrument by means of an insulating lightning-protector from the jumping of a spark across it from layer to layer.

**Insulation Lightning-Protector.**—A lightning protector by means of which a discharge is prevented from jumping across the coils of an instrument from layer to layer, and thus damaging its insulation.

**Insulation Materials.**—(1) Materials whose resistivity is high. (2) Non-conductors.

**Insulation Resistance.**—(1) The resistance existing between a conductor and the earth, or between two conductors in a circuit through insulating materials lying between them. (2) The resistance taken between a line or conductor and the earth through the insulators, or between two separate wires of a cable through the insulating materials separating them. (3) A term sometimes applied to the resistance of the insulating material of a covered wire or conductor. (4) The resistance of any insulation.

**Insulator.**—Any device employed for insulating a wire or other body.

**Insulator Bracket.**—A frame of wood or metal for holding the insulator of an overhead wire, and of such simple form as to be readily attached to a wall or support.

**Insulator Cap.**—A cover or cap placed some distance above an insulator, but separated from it by an air space.

**Insulator Pin.**—The bolt by which an insulator is attached to a bracket, pole-arm, or support.

**Intaglio.**—(1) An engraving in which the

surface is so hollowed out that an impression therefrom would give the appearance of a bas-relief. (2) The copy of a coin or other similar object obtained in an electro.

**Intake.**—A word sometimes used instead of input.

**Intake of Dynamo.**—The mechanical activity which a dynamo absorbs when running.

**Intake of Machine.**—The activity required to operate a machine.

**Intake Wires.**—The wires which feed a distribution box.

**Integrating Meter.**—Any meter which leaves a record of, and sums up, or integrates, some quantity with respect to time.

**Integrating Wattmeter.**—(1) A watt-hour meter, or a meter which integrates the power which passes through it with respect to time. (2) An energy meter.

**Integrator.**—An apparatus for automatically performing the operation of integration, or the continuous summing up of instantaneous values.

**Intensity.**—(1) The surface density of a vector or directed quantity. (2) The degree of concentration with which a number of forces act.

**Intensity Armature.**—A term formerly employed for an armature with coils of many turns, and, consequently, of a comparatively high resistance. (Obsolete.)

**Intensity Current.**—A term formerly employed for the current produced by a series-connected battery. (Obsolete.)

**Intensity of Current.**—(1) A term taken from the French language to indicate current strength. (2) Current density, or current strength per-unit-area of normal cross-section.

**Intensity of Field.**—The strength or density of a magnetic field as measured by the quantity of magnetic flux that passes through it per-unit-of-area of normal cross-section.

**Intensity of Illumination.**—The quantity of light received per-unit-of-surface.

**Intensity of Light.**—(1) In a given direction of emission, the ratio of the flux of light in a small solid angle containing that direction to the solid angle. (2) The candle-power of a light.

**Intensity of Magnetic Flux.**—(1) The quantity of magnetic flux per-unit-of-area of normal cross-section. (2) The density of magnetic flux.

**Intensity of Magnetisation.**—(1) A

quantity which represents the intensity of magnetization produced in a substance. (2) A quantity which represents the intensity with which a magnetizable substance is magnetized. (3) Magnetic moment per-unit-volume. (4) The surface density of imaginary magnetic matter on any surface normal to the direction of magnetization.

**Intensity of Radiation.**—(1) The ratio existing between the amount or quantity of radiation, and the surface from which that radiation takes place. (2) The ratio of the flux of energy in any small solid angle of a beam to the solid angle.

**Interactance.**—In an induction coil operated on a simple alternating-current circuit, the product of the mutual inductance and the angular velocity corresponding to the frequency of the current, and expressible in ohms.

**Inter Air-Space.**—A term sometimes employed for the air-space or entrefer.

**Inter-Atomic Ether.**—A term sometimes used for the ether existing between the constituent atoms of the molecules.

**Inter-Connected Armature-Winding.** (1) Such a connection of the separate circuits in a multipolar armature as will permit a single pair of brushes to be employed on the commutator. (2) A cross-connected armature.

**Inter-Connection.**—The cross-connection of an armature.

**Inter-Crossing.**—In a system of telephonic circuits, a device for avoiding the disturbing effects of induction, by alternately crossing equal sections of the line wires.

**Inter-Exchange Working.**—(1) Telephonic communication effected through the medium of more than a single exchange. (2) Telephone communication passing between two exchanges, or between two subscribers connected therewith.

**Interference of Electro-Magnetic Waves.**—Interference effects, similar to those produced in the case of light and sound, observed in electro-magnetic waves when two systems of waves of equal frequency simultaneously act, in opposed phases, on the same medium.

**Inter-Ferric Gap.**—(1) An air-gap in an ferro-ferric magnetic circuit between iron and iron. (2) The entrefer.

**Inter-Ferric Space.**—An inter-ferric gap.

**Interflange.**—The distance between the two flanges of a bobbin, measured parallel to the bobbin's axis, and represent-

ing the length of the cylindrical which may be occupied by wire when the bobbin is wound.

**Interior-Induction.**—Mutual induction.

**Interior Conduit.**—(1) A conduit inside the walls of a house, or in convenient spaces within a house, for the reception of the house wires. (2) A conduit in the walls or floors of a building provided for accommodating conductors.

**Interior-Conduit Junction-Box.** A box provided in a system of interior conduits to receive the terminals of feeders, and in which connection is made between the feeders and the mains and branches.

**Interior-Pole Dynamo.**—A dynamo having field poles in the interior of a cylindrical or Gramme-ring armature.

**Inter-Linked Diphas-System.** A three-wire diphas-system.

**Inter-Linked Polyphase-System.** A polyphase system of conductors connected that one wire serves as return for another, and distinct from a polyphase system in which each phase is provided with a separate return.

**Inter-Locking Apparatus.**—A device for mechanically operating railroad switches and semaphoric signals from a distant signaling tower, for the purpose of locking the position of such switches or signals means of a system of inter-locking so inter-locked as to render it impossible to alter a route has once been set until a signal given, to clear a signal for a route that would conflict with the one already set up.

**Inter-Locking Magnet.**—A magnet employed in a system of electric signals for crossings, whereby a magnet caused to ring at the crossings on the approach of a train, and is automatically stopped by the same train after it has passed the crossing.

**Intermediate Cable.**—A type of cable intermediate between a shore cable and a deep-sea cable.

**Intermediate Station.**—Any station between the terminal stations of a telegraph line.

**Intermediate Switch.**—A switch played at an intermediate telegraph station for communicating with a terminal station at will, without interrupting the line.

**Intermittent.**—(1) Acting at intervals only. (2) Fluctuating or pulsating.

**Intermittent Contact.**—The occasional contact of a telegraphic or other line with other wires or conductors, by swinging, or by alternate contractions and expansions, occasioned by changes of temperature.

**Intermittent Cross.**—(1) An accidental contact, generally metallic, occasioned by wires being brought into occasional contact with one another, or with some other conductor by the intermittent action of the wind. (2) A swinging cross.

**Intermittent Current.**—A current that does not flow continuously, but which flows and ceases to flow at intervals so that electricity is practically alternately present and absent from the circuit.

**Intermittent Currents of Wheatstone System.**—In the Wheatstone automatic system the transmission of short initial and final currents in each signal.

**Intermittent Disconnection.**—Any fault in a line which occurs at intervals or intermittently.

**Intermittent Electromotive Force.**—An electromotive force which acts intermittently.

**Intermittent Earth.**—(1) A fault in a telegraphic or other line in which, by the action of the wind, or by occasional expansion by heat, the line is brought into intermittent contact with the earth. (2) A swinging earth.

**Intermittent Integrating Meter.**—A meter which does not take a reading of the current or power continuously, but at regular intervals, and then adds up the result.

**Intermittent System of Currents.**—A system of currents employed in telegraphy in which the initial and final currents are separated by an interval or insulation.

**Interrupter.**—An interrupter.

**Inter-Molecular.**—Between the molecules.

**Inter-Molecular Ether.**—A term sometimes used for the ether that exists between the molecules of matter.

**Internal Armature Generator.**—A generator in which the armature is situated within the field-poles, as distinguished from a generator whose armature is external to the field.

**Internal Characteristic of Dynamo.**—A curve showing the E. M. F. generated in a dynamo under varying excitation, as distinguished from the external characteristic showing the E. M. F. at terminals.

**Internal Circuit.**—That part of a circuit which is included within the electric source.

**Internal Magnetic Circuit.**—A term sometimes employed for that part of a magnetic circuit which lies within the magnetic core.

**Internal Magnetic Field.**—That portion of a magnetic field produced by a magnet which lies within the magnetic core.

**Internal Polarization of Moist Body.**—A polarization exhibited by such moist bodies as nervous or muscular fibres, the juicy parts of vegetables and animals, or in general, by all bodies possessing a firm structure and filled with a liquid, on the passage through them of a strong electric current.

**Internal Poles of Dynamo.**—(1) The inwardly projecting field poles of a dynamo. (2) Magnetic field-poles internal to an armature.

**International Ampere.**—(1) The value of the ampere as adopted by the International Congress of 1893, at Chicago. (2) The value of an ampere equal to the one-tenth of a unit of current in the C. G. S. system of electro-magnetic units, and represented with sufficient accuracy for practical purposes, by the unvarying current, which, when passed through a solution of nitrate of silver in water, in accordance with certain specifications, deposits silver at the rate of 0.001118 of a gramme-per-second.

**International Coulomb.**—(1) The value of the coulomb as adopted by the International Electrical Congress of 1893, at Chicago. (2) The quantity of electricity equal to that transferred through a circuit by a current of one International ampere in one second.

**International Farad.**—(1) The value of the farad as adopted by the International Electrical Congress of 1893, at Chicago. (2) The capacity of a conductor charged to a potential of one International volt by one International coulomb of electricity.

**International Henry.**—(1) The value of the henry as adopted by the International Electrical Congress of 1893, at Chicago. (2) The value of the induction in a circuit, when the electromotive force induced in the circuit is one International volt, and the inducing current varies at the rate of one ampere per second.

**International Joule.**—(1) The value of the joule as adopted by the International Electrical Congress of 1893, at Chicago. (2) A value equal to  $10^7$  units of work of



the C. G. S. system and represented with sufficient accuracy for practical purposes by the energy expended in one second by one ampere in one International ohm.

**International Morse Code.**—A term sometimes employed for the International telegraphic alphabet, as distinguished from the American Morse Code.

**International Ohm.**—(1) The value of the ohm as adopted by the International Electrical Congress of 1893, at Chicago. (2) A value of the ohm equal to  $10^9$  units of resistance of the C. G. S. system of electro-magnetic units, and represented by the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grammes in mass, of a constant cross-sectional area, and of the length of 106.3 centimetres.

**International Telegraphic Code.**—The International Morse Code.

**International Unit of Activity.**—The International watt.

**International Unit of Work.**—The International joule.

**International Volt.**—(1) The value of the volt as adopted by the International Electrical Congress of 1893, at Chicago. (2) Such an electromotive force that steadily applied to a conductor whose resistance is one International ohm, will produce a current of one International ampere, and which is represented with sufficient accuracy for practical use by  $\frac{44}{117}$  of the electromotive force between the poles or electrodes of the voltaic cell known as Clark's cell, at a temperature of 15° Cent. when prepared in accordance with certain specifications.

**International Watt.**—(1) The value of the watt as adopted by the International Electrical Congress of 1893, at Chicago. (2) A value equal to  $10^7$  units of activity in the C. G. S. system, and equal to the work done at the rate of one joule-per-second.

**Inter-Node.**—The space between two adjacent nodes.

**Inter-Polar.**—Between the poles.

**Inter-Polar Gap.**—An air-gap or space between the faces of opposing pole-pieces.

**Inter-Polar Space.**—The inter-polar gap.

**Interpolated Commutator Segments.** Blank commutator segments.

**Interrupted.**—Broken or opened.

**Interrupted Current System.**—A system of electric distribution effected by the aid of periodically interrupted continuous currents.

**Interrupter.**—Any device for interrupting or breaking a circuit.

**Inter-Urban Communication.**—Telegraphic or telephonic communication between adjacent cities.

**Inter-Urban Electric Railway.**—An electric railway suitable for use between adjacent cities.

**Inter-Urban Telephony.**—Telephonic communication carried on between adjacent cities.

**Intra-Molecular.**—(1) Inter-molecular, or between the molecules. (2) Within the confines of a molecule.

**Intra-Polar Electrolysis.**—Electrolytic action taking place in the region between the electrodes, as distinguished from that which occurs in their immediate vicinity.

**Intrinsic Brilliancy of Luminous Source.**—(1) At any point of a luminous surface the ratio of the luminous intensity along the normal to the small surface area from which it is emitted. (2) Luminous intensity per-unit-area of normal luminous surface.

**Intrinsic Electrization.**—A term proposed for permanent impressed electrization in a substance from internal causes.

**Intrinsic Intensity of Light.**—The quantity or flux of light emitted normally from a unit of surface of a luminous source.

**Intrinsic Magnetization.**—Magnetization due to impressed magnetic force, as distinguished from magnetization due to electric currents.

**Intrinsic Radiation of Luminous Source.**—(1) The radiation of a luminous source expressed in lumens-per-square-centimetre. (2) The flux density of light issuing normally from a luminous source.

**Invariable Calibration of Galvanometer.**—In a galvanometer with absolute calibration, a method for preventing the occurrence of variations in the intensity of the field of a galvanometer, due to the neighborhood of masses of iron.

**Inverse Current.**—(1) The current which tends to be produced by a current in its own circuit on making or closing the circuit. (2) The current produced in the secondary of an induction coil on the making or completion of the circuit of the primary. (3) The make-induced current.

**Inverse Electromotive Force.**—An electromotive force which acts in the opposite direction to another already existing electromotive force.

**Inverse Secondary Current.**—The make-induced current.



**Inversion, Electric.**—The determination of electric distribution over the surfaces of neighboring electrified conductors by the geometrical method of inversion.

**Invert Insulator.**—An insulator supported in an inverted position.

**Inverted Arc.**—An inverted arc-lamp.

**Inverted Arc-Lamp.**—An electric arc-lamp in which the positive carbon is lowermost, or inverted, as compared with its position in the ordinary arc-lamp.

**Inverted Dynamo.**—A dynamo whose armature bore or chamber is placed below the field-magnet coils.

**Inverted Induction-Coil.**—A term sometimes employed for a step-down transformer.

**Invisible Electric-Contact Matting.**—A matting or other floor covering, provided with a series of invisible electric contacts, which are closed by a person walking over them.

**Invisible Spectrum.**—That portion of the spectrum which is incapable of affecting the eye as light.

**Ionic.**—Of or pertaining to the ions.

**Ions.**—The groups of atoms or radicals into which a molecule is separated by electrolytic decomposition.

**Ionic Attraction.**—The mutual attraction produced by the cations and the anions.

**Ionic Conductivities.**—Specific conductivities of ions, so selected that their sums give molecular conductivities for any combination of ions.

**Ionisation.**—(1) The decrease in the strength with which the separate atoms or radicals are held together in the molecules of an electrolyte. (2) A modified dissociation of the molecule of an electrolyte which consists in the weakening of the force which holds together its ions or radicals.

**Iron-Armored Conduit.**—(1) A conduit provided with an exterior iron casing or covering. (2) A conduit in which each duct has an iron casing or covering.

**Iron-Clad.**—Surrounded by iron.

**Iron-Clad Armature.**—(1) The armature of a dynamo or motor, whose insulated coils are entirely or nearly surrounded by the iron of the armature core. (2) An armature in which the conductors are buried in slots, grooves, or tunnels below the surface of the armature core.

**Iron-Clad Armature Windings.**—Armature windings that are entirely or nearly surrounded by iron.

**Iron-Clad Coil.**—An iron-clad magnet.

**Iron-Clad Drop.**—An annunciator or telephone drop whose electro-magnet is iron-clad.

**Iron-Clad Dynamo.**—(1) A dynamo whose armature is iron-clad. (2) An iron-encased dynamo.

**Iron-Clad Electro-Magnet.**—An electro-magnet whose magnetizing coil is almost entirely surrounded by iron—in some cases to increase its portative power, in others to increase its inductance, and in yet others to shield its magnetic variations.

**Iron-Clad Generator.**—An iron-clad dynamo.

**Iron-Clad Inductance.**—An inductance associated with a ferric or ferro-ferric magnetic circuit, as distinguished from an inductance associated with a non-ferric magnetic circuit.

**Iron-Clad Magnet.**—(1) An electro-magnet whose magnetic resistance is lowered by a casing of iron connected with the core, and provided for the passage of the magnetic flux. (2) An iron-clad electro-magnet.

**Iron-Clad Motor.**—A motor whose armature is iron-clad. (2) An iron-encased motor.

**Iron-Clad Rheostat.**—A rheostat whose resistance coils are provided with an enamelled insulation, and imbedded in a mass of iron.

**Iron Core.**—The mass of iron on which are placed the magnetizing coils of an electro-magnet or solenoid.

**Iron-Core Loss.**—The hysteretic and Foucault losses due to the presence of an iron core.

**Iron Covered Cable.**—A submarine cable provided with an iron sheathing.

**Iron-Enclosed Electro-Magnet.**—An iron-clad electro-magnet.

**Iron-Loss in Transformer.**—The loss of energy in a transformer due both to magnetic hysteresis or magnetic friction, and to the setting up of eddy or Foucault currents in the iron.

**Iron Magnetic Circuit.**—A ferric magnetic circuit.

**Iron Reluctance.**—(1) The reluctance in a magnetic circuit due to the presence of iron in that circuit. (2) Reluctance in iron.

**Iron-Work Fault of Dynamo.**—A ground or connection between the circuit of a dynamo and any part of its iron frame.

**Irrationality of Dispersion.**—A lack of proportionality in the dispersions of spectra produced by different refractive media.

**Irreciprocal Conduction.**—(1) Conduction in which the magnitude of the current is altered when its direction is reversed. (2) The electric conduction in an asymmetrical resistance.

**Irregular Magnetic Flux.**—Magnetic flux which is not uniform, but is either converging or diverging, as distinguished from uniform magnetic flux.

**Irregular Variation.**—Any variation of the magnetic needle which occurs at irregular intervals.

**Irreversible Heat.**—(1) Heat produced in a homogeneous conductor by the passage of electricity through it in any direction. (2) In an electric circuit the joulean heating effect as distinguished from the Peltier effect. (3) In an electric circuit any development of heat by the current, which does not depend upon its direction.

**Iridesceence.**—Interference effects producing rainbow-colored tints by the refraction of light from thin, transparent, finely striated surfaces.

**Irritability, Electric.**—The irritability of nerves or muscles produced by an electric current or discharge.

**Irrotational Stress.**—(1) Stress unaccompanied by rotation. (2) A stress devoid of curl.

**Isobaric Lines.**—Isobars.

**Isobarometric Lines.**—The isobaric lines.

**Isobars.**—(1) Lines connecting places on the earth's surface which simultaneously have the same barometric pressure. (2) The isobaric lines.

**Isochasmic Curves.**—Curves drawn on the earth's surface between zones having equal frequency of auroral discharges.

**Isochronism.**—Equality of time-vibration or motion.

**Isochronize.**—To produce equality of time-vibration or motion.

**Isochronizing.** Producing equality of time-vibration or motion.

**Isochronous Oscillations.**—Isochronous vibrations.

**Isochronous Vibrations.**—Vibrations or oscillations which perform their to-and-fro motions on either side of the position of rest in equal times.

**Isoclinal.**—Possessing the same inclination.

**Isoclinal Lines.**—Lines connecting places

on the earth's surface which have the same magnetic inclination or dip.

**Isoclinical Chart.**—A map or chart on which isoclinical lines are marked.

**Isoclinic.**—Of or pertaining to the isoclinals.

**Isodynamic.**—Possessing equal force.

**Isodynamic Chart or Map.**—A map or chart on which isodynamic lines are marked.

**Isodynamic Lines.**—Lines connecting places which have the same total magnetic intensity.

**Iso-Electric Points.**—A term sometimes used in electro-therapeutics for points of equal potential.

**Isogonal.**—Of or pertaining to the isogonal lines.

**Isogonal Chart or Map.**—A chart or map on which the isogonal lines are marked.

**Isogonal Lines.**—Lines connecting places on the earth's surface which have the same magnetic declination.

**Isogonic.**—Of or pertaining to the isogonal lines.

**Isolated Electric Lighting.**—Electric lighting in which the plant is located on the premises that are to be lighted as distinguished from a plant located at a station, central rather than a number of buildings, or to an extended area to be lighted.

**Isolated Plant.**—An electric plant or distribution system confined to a building or group of buildings as distinguished from a central-station system.

**Isolated-Station Telephone Switchboard.**—A switchboard established for the inter-communication of a number of telephoners, where the distance separating them is considerable, or where privacy in the communication is essential. (2) A small sub-station telephone switchboard. (3) A domestic telephone switchboard.

**Isolatine.**—A variety of insulating material.

**Isolating Switch for Lamps.**—A short-circuiting switch designed to cut a lamp completely out of connection with a circuit without opening or breaking the circuit of other lamps.

**Isolux.**—(1) A line connecting points of equal illumination on any illumined surface. (2) A line of equal illumination.

**Isothermal Expansion of Gas.**—The expansion of a gas whose temperature is maintained constant.

**Isomorphism.**—The quality of possessing the same crystalline form.

**Isomerism.**—A state or condition of compound substances which, though identical in composition, yet possess entirely different properties.

**Isothermal Surfaces.**—Surfaces on a body, all points of which have the same temperature.

**Isothermals.**—Lines connecting places on the earth's surface which have the same mean annual temperature.

**Isotropic.**—Possessing equal elasticity in all directions.

**Isotropic Conductor.**—(1) A substance which possesses the same powers of electric conduction in all directions. (2) An electrically homogeneous conducting medium.

**Isotropic Dielectric.**—A dielectric possessing the same powers of inductive capacity in all directions.

**Isotropic Medium.**—A medium possessing the same properties in all directions.

**Isotropism.**—The quality of possessing equal elasticity in all directions.

**Isthmus Method of Magnetization.**—A method of obtaining an exceedingly strong magnetization by so placing the body to be magnetized that it forms a narrow isthmus between the pole-pieces of a powerful electro-magnet.

**Isynchronous Vibrations.**—(1) Vibrations possessing equality of time of vibration or motion. (2) Isochronous vibrations.

## J

**J.**—A contraction proposed for joule.

**Jablochhoff Candle.**—An electric arc light in which the two carbon electrodes are placed parallel to each other, and maintained at a constant distance apart by means of a strip of an insulating substance placed between them.

**Jablochhoff's Igniter.**—A small strip of carbon or carbonaceous material that is readily rendered incandescent by a current, placed between the free ends of the parallel carbons of a Jablochhoff candle, for the formation of an arc on the passage of the current.

**Jack Hole.**—In a telephone switchboard the hole leading into a jack.

**Jack Panel.**—The panel of a telephone switchboard provided for the support of the jacks.

**Jack Switch.**—A switch operated by means of a spring jack.

**Jackoted Magnet.**—A term sometimes applied to an iron-clad magnet.

**Jacobi's Law.**—The maximum activity is performed by an electric motor when its counter electromotive force is equal to one-half of the impressed electromotive force.

**Jacobi's Unit of Current.**—Such a current that when passed through a voltmeter will liberate a cubic centimetre of oxygen and hydrogen per second at zero (0° C.) and 760 millimetres barometric pressure.

**Jacobi's Unit of Resistance.**—(1) The

electric resistance of 35 feet of a certain copper wire weighing 345 grains. (2) The resistance of a copper wire one metre in length and one millimetre in diameter of cross-section.

**Jar, Electric.**—A name formerly given to a Leyden jar.

**Jar of Secondary Cell.**—The jar in which the electrolyte and plates of a secondary cell are placed.

**Jaws of Switch.**—The metallic clips provided for the reception of the knife-blades of a switch.

**Jet Photomotor.**—An apparatus for determining the candle-power of an illuminating gas by means of the height of a jet of such gas when burning under constant conditions of pressure and temperature.

**Jewelry, Electric.**—Minute incandescent lamps substituted for gems in articles of jewelry.

**Jockey Gear.**—The cable gear through which a cable has to pass when entering or leaving a picking-up or paying-out drum, and in which it passes under weighted wheels, called jockey wheels, for the purpose of maintaining a uniform tension of the cable upon the drum so as to prevent slip.

**Jockey of Relay.**—A form of extension tongue pivoted friction-tight upon the tongue of a sensitive relay employed in submarine telegraphy.

**Jockey Wheel.**—A weighted wheel riding over a cable on a grooved wheel in a

cable ship for the purpose of preserving uniformity of tension in the cable.

**Joining-Up.**—(1) Connecting in series or multiple-arc. (2) Generally, connecting or placing in a circuit.

**Joining-Up a Wire.**—Connecting a wire to an apparatus or circuit after it has been disconnected or grounded.

**Joint.**—(1) The junction of two or more pieces or conductors. (2) The place where the junction of two or more pieces or conductors is effected.

**Joint Admittance.**—The total or combined admittance of a number of separate admittances connected in parallel.

**Joint Conductance.**—The combined conductance of a number of separate conductances connected in parallel.

**Joint-Cooling Tray.**—A tray employed for cooling a cable core-joint by a cooling mixture.

**Joint Magnetomotive Force.**—The resultant magnetomotive force of a number of simultaneously acting magnetomotive forces.

**Joint Reluctance.**—The combined reluctance of a number of parallel-connected reluctances.

**Joint Reluctivity.**—The reluctivity of a number of parallel-connected reluctivities.

**Joint Resistance.**—The combined resistance of a number of parallel-connected resistances.

**Joint Trough.**—A trough of water or cooling solution in which a submarine cable joint is submerged for cooling.

**Jointless Conductor.**—A conductor in a single length and without joint.

**Joulad.**—A term proposed for joule. (Not in use.)

**Joule.**—(1) A volt-coulomb or unit of electric energy or work. (2) The amount of electric work required to raise the potential of one coulomb of electricity one volt. (3) Ten million ergs.

**Joule Effect.**—The heating effect produced by the passage of an electric current through a conductor, arising from its resistance only.

**Jouleian Effect.**—A word sometimes used for joule effect.

**Joule Meter.**—(1) Any apparatus capable of measuring energy in joules. (2) An energy meter, as distinguished from a wattmeter.

**Joule-Per-Second.**—A unit of activity,

equal to the expenditure of one joule in each second.

**Joule's Cylindrical Electro-Magnet.**—An electro-magnet provided with a helical cylindrical core.

**Joule's Equivalent.**—The mechanical equivalent of heat.

**Joule's Law.**—The heating power of a current is proportional to the product of the square of its strength and the resistance of the circuit through which it passes.

**Journal.**—That portion of a shaft which revolves on a bearing.

**Journal Friction.**—Friction produced by the rotation of a shaft on a bearing.

**Jumper.**—A temporary shunt or short circuit put around a source, lamp or receiving device on a series-connected circuit, to enable it to be readily removed or repaired.

**Jump Spark.**—A disruptive spark obtained between two opposed conducting surfaces, as distinguished from a spark obtained by or following a wiping contact.

**Jump-Spark Burner.**—A term sometimes applied to a gas burner in which the issuing jet is ignited by means of a high-tension spark obtained between two opposed points.

**Junction.**—In telephony, a wire or circuit connecting two exchanges.

**Junction Board.**—In telephony, a switchboard at which junction wires terminate.

**Junction Box.**—A moisture-proof box provided in a system of underground conductors to receive the terminals of the feeders, and in which connection is made between the feeders and the mains, and through which the current is distributed to the individual consumers.

**Junction Calls.**—Telephonic calls arriving on a junction line.

**Junction Circuit.**—In telephony, a line connecting a trunk circuit with a local subscriber.

**Junction Line.**—(1) In telephony, a junction. (2) A line connecting two telephone exchanges.

**Junction-Line Plug.**—In a central telephone exchange, a plug connected with a junction line.

**Junction Lines.**—Lines connecting two or more telephone exchanges, as distinguished from subscribers' lines.

**Junction Operator.**—In telephony, an operator at a junction board.



**Junction Surface of Voltaic Cell.**—The contact surface between the elements of a voltaic cell and the electrolyte.

**Junction Wires.**—Junction lines.

**Junction Working.**—Inter-exchange telephone working.

**Just Non-Oscillatory Discharge.**—A discharge which is just non-oscillatory.

## K

**K.**—A symbol for electrostatic capacity.

**K.**—A symbol for moment of inertia.

**$\kappa$ .**—A symbol for magnetic susceptibility.

**K. C. C.**—A contraction for cathodic closure contraction.

**K. D. C.**—A contraction for cathodic duration contraction.

**K. W.**—A contraction for kilowatt.

**kg.**—An abbreviation for kilogramme, a practical unit of mass.

**kg : cm<sup>2</sup>.**—An abbreviation for kilogramme-per-square-centimetre, a practical unit of pressure.

**kgm.**—An abbreviation for kilogramme-metre, a practical unit of the moment of a couple or of work.

**kgm : s.**—An abbreviation proposed for kilogramme-metre-per-second, a practical unit of power.

**KR.**—A contraction for the total capacity of a telegraph or telephone wire or conductor, multiplied by its total resistance.

**KR Law.**—(1) A well-recognized law that the limiting speed of signalling through a submarine cable, assuming a given receiving and sending apparatus in uniform adjustment, varies inversely as the KR of the cable. (2) A generalization claimed as a law by some, but denied by most, which assigns the distance through which intelligible telephone communication can be carried, to cases where the product of K, the capacity of the telephone circuit and R, its resistance, does not exceed a certain value.

**Kaolin.**—A variety of white clay sometimes employed for insulating purposes.

**Kapp Lines.**—A term proposed for unit lines of magnetic force or flux.

**Karsten's Figures.**—A name sometimes applied to electric breath figures.

**Kartavert.**—A variety of insulating material.

**Katalysis.**—An orthography sometimes employed for catalysis.

**Katelectrotonus.**—Catelectrotonus.

**Kathelectrotonic State.**—The cathoelectrotonic state.

**Kathoelectrotonus Zone.**—Cathoelectrotonic zone.

**Kathelectrotonus.**—Cathoelectrotonus.

**Kathetometer.**—A cathetometer.

**Kathion.**—A cation.

**Kathodal.**—Cathodal.

**Kathode.**—A cathode.

**Kathodic.**—Cathodic.

**Kathodic Electro-Diagnostic Reactions.**—Cathodic electro-diagnostic reactions.

**Kathodic Rays.**—Cathodic rays.

**Kations.**—Cations.

**"Keeper" of Inductor Alternator.**—A word sometimes employed for inductor.

**Keeper of Magnet.**—A mass of soft iron applied to the poles of a magnet, and through which its magnetic flux passes.

**Kelvin.**—(1) A word proposed, but not adopted, for a kilowatt-hour or one thousand watt hours. (2) A word proposed for the Board of Trade unit.

**Kelvin Balance.**—A form of electro-dynamometer balance designed by Lord Kelvin.

**Kerite.**—A variety of insulating material.

**Kerite Tape.**—A kerite-covered insulating tape.

**Kerr Effect.**—The elliptical polarization of a beam of plane polarized light, produced by its passage across an electrized dielectric.

**Key-Board.**—Any board to which electric keys or switches are connected.

**Key-Board Transmitter.**—The transmitter employed in a step-by-step or printing telegraph.

**Key Lamp-Socket.**—A lamp-socket provided with a key for lighting or extinguishing the lamp.

**Keyless.**—Devoid of a key.

**Keyless Fire-Alarm Box.**—A fire-alarm box covered with a glass window which requires to be broken in order to send the alarm.

**Keyless Lamp-Socket.**—A lamp-socket unprovided with a key, and whose lamp, therefore, requires to be lighted and extinguished by a switch placed elsewhere.

**Keyless Wall-Socket.**—A socket placed on a wall, provided for the reception of a plug switch for the introduction of a lamp.

**Kick.**—A recoil.

**Kick of Coil.**—The discharge from an electromagnetic coil.

**Kick of Relay.**—An impulse communicated to the tongue of a relay by a discharge from the line.

**Kicking Coil.**—A choking coil.

**Kicks.**—In telegraphy, sudden impulses of a mirror spot, or siphon, due to a momentary earth current or discharge.

**Kilerg.**—One thousand ergs.

**Killing Wire.**—(1) A method formerly adopted for removing kinks, bends and flaws in iron by stretching it on the line in long lengths. (2) A method of straightening wire by subjecting it to tension. (3) A term sometimes applied to loss of elasticity of contact springs of switches, due to their over-heating by the current.

**Kilo.**—A prefix for one thousand times.

**Kilo-Ampere.**—One thousand amperes.

**Kilo-Ampere Balance.**—A balance form of ammeter which measures thousands of amperes.

**Kilo-Dyne.**—One thousand dynes.

**Kilo-Erg.**—One thousand ergs.

**Kilo-Gauss.**—One thousand gauss.

**Kilogramme.**—One thousand grammes, or 2.2046 pounds avoirdupois.

**Kilogramme-Metro.**—A unit of work equal at Washington, D.C., to 9.81 multiplied by 10<sup>7</sup> ergs.

**Kilo-Henry.**—One thousand henrys.

**Kilo-Joule.**—One thousand joules.

**Kilo-Lines.**—One thousand lines of force.

**Kilometre.**—One thousand metres.

**Kilometric Capacity of Cable.**—The capacity of a cable in micro-farads per kilometre.

**Kilometric Insulation of Cable.**—The insulation of a cable measured in megohm-kilometres, or the average insulation of one kilometre in megohms.

**Kilo-Volt.**—One thousand volts.

**Kilo-Watt.**—One thousand watts.

**Kilo-Watt-Hour.**—(1) The amount of work equal to that performed by an activity of one kilowatt maintained steadily for one hour. (2) An amount of work equal to 3,600,000 joules.

**Kilo-Watt Hour Meter.**—A form of recording watt-meter.

**Kilo-Weber.**—One thousand webers.

**Kine.**—A unit of velocity, proposed by the British Association, equal to a centimetre-per-second.

**Kinematics.**—That branch of science which treats of motion, irrespective of the mass moved, or of the forces which produce or oppose the motion.

**Kinetic Energy.**—Energy producing motion, as distinguished from potential energy, or energy capable of producing motion.

**Kinetic Induction.**—Dynamic or mutual induction.

**Kinetic Theory of Matter.**—A theory which assumes that the molecules of matter are in a constant state of molecular vibration towards or from one another in paths that lie within the spheres of their mutual attractions or repulsions.

**Kinetics.**—That branch of dynamics which treats of the action of forces in producing or modifying motion.

**Kinetoscope.**—A means for obtaining the effect of moving objects by means of a rapid succession of suitable pictures.

**Kinetograph.**—(1) A term at one time applied to a device proposed for the simultaneous reproduction of a distant tag and its actors under circumstances such that the actors can be heard at any distance from the theatre. (2) An apparatus for reproducing on a screen the image of a moving object.

**Kirchoff's Laws.**—The Laws for the pressures and currents in branched or divided circuits.

**Kneading Tools.**—Tools for shaping gutta-percha laid on a joint between gutta-percha covered wires.

**Knife-Break Switch.**—A knife switch.

**Knife-Edge Suspension.**—The suspension of a needle or system on knife-edges, supported on steel or agate plates.

**Knife-Edge Switch.**—A term sometimes used for knife-switch.

**Knife-Switch.**—(1) A switch which is opened or closed by the motion of a knife contact between parallel contact plates. (2) A knife-edge switch or knife switch.

**Knob Insulator.**—An insulator shaped like a knob and divided into two parts suitable for supporting a single wire when clamped together by its supporting screw.

**Knot.**—(1) A nautical mile, or 6082 feet. (2) A length equal to one minute of arc in terrestrial latitude. (3) A unit of velocity at sea equal to one naut per hour, or

tained from an observation of a knotted log-cord thrown overboard.

**Knot-Pound.**—A standard of conductivity of copper referred to a length of one knot and a conductor weight of one pound, and sometimes employed in submarine telegraphy.

**Kohlrausch's Law.**—In electrolytic conduction, the rate of motion of each atom in a given liquid is independent of the element with which it may have been combined.

**Krink's Bars or Cores.**—Iron bars or

cores of various shapes, provided for solenoids, in which the distribution of the metal is so proportioned as to ensure a nearly uniform attraction or pull in different positions of the solenoid.

**Kruss' Optical Scale.**—A scale employed for measuring the height of a flame.

**Kyanized.**—Subjected to the kyanizing process.

**Kyanizing.**—A process employed for the preservation of wooden telegraph poles, or railroad ties or sleepers, by injecting a solution of corrosive sublimate into the pores of the wood.

## L

**L.**—A symbol for coefficient of inductance.

**L.**—A contraction for length.

**L.**—A symbol for the coefficient of inductance or self-induction. (Partly international notation.)

**L<sub>m</sub>.**—A symbol proposed for coefficient of mutual-induction, or mutual inductance.

**L.**—A symbol proposed for coefficient of self-induction, or self-inductance.

**Labile Galvanization.**—A term employed in electrotherapeutics, in contradistinction to stable galvanization, to designate the method of applying the current by keeping one electrode at rest, in firm contact with one part of the body, and connecting the other electrode to a sponge which is moved over the parts of the body that are to be treated.

**Lag.**—(1) Falling behind. (2) To fall behind.

**Lag of Motor Brushes.**—A movement of the brushes of a motor to a position on the commutator, in the opposite direction to its rotation, in order to obtain freedom from sparking.

**Lag of Resultant Flux.**—The displacement in phase of the magnetic flux in an induction motor behind the impressed magneto-motive force.

**Lagging Electromotive Force.**—An electromotive force or component of electromotive force lagging behind a current or flux.

**Lagging Current.**—A periodic current lagging behind the impressed electromotive force which produces it.

**Lagging of Current.**—An alternating current which is retarded in phase behind the pressure which produces it.

**Lagging of Magnetization.**—(1) A re-

tardation in the magnetization as compared with the magnetizing electromotive force. (2) A cyclic retardation of magnetization in a transformer due to hysteresis.

**Lambert's Discharge Key.**—A highly insulated form of double-contact key, used in testing.

**Lamellar.**—Composed of parallel plates or laminae.

**Lamellar Distribution of Magnetism.**

(1) The distribution of magnetism in magnetic shells. (2) Such a distribution of magnetism in a thin plate that the magnetized particles are arranged with their greatest lengths in the direction of the thickness of the plate, so that all the poles are situated at or near the faces of the plate, and, consequently, the extent of such polar surfaces is great when compared with the thickness of the plate.

**Lamellar Magnet.**—A magnet whose magnetism is characterized by lamellar distribution.

**Laminated.**—Built up or composed of laminae.

**Laminated Core.**—An iron core that has been sub-divided in planes parallel to its magnetic flux-paths, in order to avoid the injurious production of Foucault or eddy currents.

**Laminated Magnet.**—A magnet provided with a laminated core.

**Laminating.**—Sub-dividing into laminae.

**Lamination.**—The sub-division of an iron core into laminae.

**Lamination of Armature Core.**—The sub-division of the iron core of a dynamo or motor armature into a number of in-

ulated parallel strips or plates, for the purpose of avoiding eddy currents.

**Lamination of Conductors.**—(1) The division of a conductor into a number of parallel strands or wires, for the purpose either of lessening the eddy currents produced in its mass, or for reducing the skin effect when alternating currents are employed. (2) A stranded conductor.

**Lamp Adapter.**—(1) A device which permits an electric lamp to replace an ordinary gas burner on a gas bracket or chandelier. (2) A device which permits an electric lamp base of one manufacturer to be readily inserted in the socket of another manufacturer.

**Lamp Base.**—The portion of an incandescent lamp chamber through which the leading-in wires are passed, provided with two metallic plates or parts, suitably insulated from one another, and electrically connected to the ends of the leading-in wires.

**Lamp Bracket, Electric.**—A device similar to that employed for a gas burner, suitable for the support of an incandescent lamp.

**Lamp Bulb.**—The chamber or globe in which the filament of an incandescent lamp is placed.

**Lamp Cap.**—The base of an incandescent lamp.

**Lamp Chamber.**—The bulb of an incandescent lamp.

**Lamp Circuit.**—A circuit containing an electric lamp or lamps.

**Lamp Clamp.**—A suitable grip for holding the rod that supports the electrode of an arc-lamp.

**Lamp Contacts.**—Metallic plates or rings placed in an incandescent lamp base, and connected to the terminals of the filament.

**Lamp Cord.**—A flexible cord containing two separately insulated wires suitable for use in connection with an incandescent lamp.

**Lamp Cut-Out.**—(1) A device so arranged as to automatically cut a series-connected arc-lamp out of the circuit, as soon as the carbons are entirely consumed. (2) A safety catch or safety fuse connected with the circuit of a multiple-connected incandescent lamp.

**Lamp Dimmer.**—A reactive coil, employed on an alternating circuit for the purpose of varying the intensity of incandescent lights connected with such circuit.

**Lamp Efficiency.**—(1) Commonly, but

illogically, the watts consumed by a lamp per candle power delivered. (2) More nearly correctly, the reciprocal of this; or the number of candles obtained from an incandescent lamp per watt supplied to it.

**Lamp Feet.**—(1) In a conducting loop, circuit, or system, the product of the number of lamps supplied and the distance at which they are supplied; each lamp being multiplied by its distance, and the sum of such products being taken. (2) A quantity sometimes used in computing distribution systems of electric lighting.

**Lamp Filament.**—The filament of an incandescent lamp.

**Lamp Fittings.**—(1) The sockets, holders, brackets, etc., required for holding, or supporting, incandescent electric lamps. (2) Lamp fixtures.

**Lamp Frame.**—The frame of an arc-lamp provided for the support of the feeding mechanism, globe, etc.

**Lamp Hanger.**—A device provided for the suspension of an arc-lamp.

**Lamp Hood.**—A hood employed to protect an arc-lamp from rain or snow, and generally so arranged as to throw its light in a downward direction.

**Lamp-Hour.**—(1) Such a service of electric current as is required to maintain one electric lamp during one hour. (2) Such a quantity of electricity, or of electric energy, as will maintain one standard lamp in normal operation for one hour.

**Lamp Indicator.**—(1) An apparatus employed in a central station to indicate the presence of the proper voltage, or potential difference, on the mains. (2) A lamp employed on a telephone switchboard to indicate when the subscriber is calling, or when he has rung off. (3) A pilot lamp. (4) Any indicating apparatus employing an electric lamp as signalling device.

**Lamp Pendant.**—A flexible cord employed for the support of a pendant lamp.

**Lamp Pillar.**—(1) A pillar supporting one or more lamps. (2) A lamp post.

**Lamp Posts.**—Posts provided for the support of lamps.

**Lamp Protector.**—A lamp hood, cover or guard.

**Lamp Receptacle.**—(1) A lamp socket or holder. (2) A receptacle for a flexible connection leading to a lamp.

**Lamp Rod.**—(1) The rod provided in an



ordinary arc-lamp for the support of the positive carbon. (2) In a focussing lamp, the rods provided for the support of the two carbons.

**Lamp Socket.**—A support provided for the reception of an incandescent lamp, so arranged that the introduction of the lamp therein, automatically connects the lamp terminals with the terminals of the supply wires.

**Lamp-Socket Rheostat.**—A regulable resistance placed in the socket of an incandescent lamp for the purpose of altering the quantity of light it emits.

**Lamp-Socket Switch.**—(1) A switch placed in the socket of an incandescent lamp, provided for lighting and extinguishing the lamp. (2) A lamp-socket key.

**Lamp Switches.**—Switches placed in the circuit of a group of incandescent lamps, either in the branches, or in the mains, for the purpose of simultaneously lighting or extinguishing a number of lamps.

**Land Line.**—(1) A telegraph line on land, either aerial or buried, as distinguished from a submarine cable. (2) An aerial telegraph line. (3) That portion of a submarine cable circuit which extends over the land.

**Lantern Lamp.**—An incandescent lamp provided with a lantern-shaped chamber surrounding the lamp chamber.

**Lantern Projector.**—A focussing arc-lamp employed in connection with a projecting apparatus.

**Lap Joint.**—(1) The joint effected by overlapping short portions near the ends of the things to be joined, and securing them to each other while in that position. (2) A joint between the ends of two conducting wires in which the two ends after being laid together, side by side, are lapped firmly together by a piece of separate wire.

**Lap-Joint for Wires.**—A joint between two wires, made by overlapping their ends and subsequently soldering.

**Lap Winding.**—A winding for a drum armature, in which the successive conducting loops are arranged on the surface of the armature over-lapping one another.

**Large Calorie.**—(1) A term sometimes used for the great calorie. (2) A kilogramme-degree-centigrade. (3) One thousand lesser calories.

**Latent.**—Hidden, concealed.

**Latent Electricity.**—A term formerly applied to bound electricity.

**Lateral.**—An offset from a conduit system

for connecting services with the conductors of a conduit.

**Lateral Bracket.**—A form of bracket for running wires from corner to corner of buildings, and for supporting an insulator in an upright position.

**Lateral Discharge.**—(1) A Leyden-jar or other impulsive discharge occurring between parts of the circuit not in the direct path of the main discharge. (2) A discharge occurring through an alternative path.

**Lateral Induction.**—(1) Induction occurring between closely-approached portions of a circuit, through which an impulsive discharge is passing. (2) The induction produced by an impulsive discharge as manifested in a lateral discharge.

**Lateral Magnetic-Leakage.**—(1) The failure of magnetic flux to pass in approximately parallel paths through a bar of iron or other magnetizable material, which has come to rest in a field in which it is free to move. (2) The escape of magnetic flux from the sides of a bar magnet, or other similar magnet, instead of from the poles at its ends.

**Lattice Pole.**—A form of structural-iron pole designed for the support of overhead wires or conductors, made in the form of a light, strong lattice.

**Lattice Work of Pole.**—A composite pole whose upper portion consists of structural lattice work, employed in cases where the stresses produced on the top of the pole are excessive by reason of the weight of the cables, or the number of lines or aerial wires supported thereon.

**Launch, Electric.**—A launch whose motive power is electric.

**Law.**—(1) In physics, any relation existing between natural phenomena and their causes. (2) The invariable manner in which physical causes produce their effects. (3) Any observed relation of sequences in the universe.

**Law of Electro-Chemical Equivalence.**—The amount of electrolytic liberation produced by an electric current passed through various chemical substances is proportional to the chemical equivalent of each substance, that is, to its atomic weight divided by its valency.

**Law of Illumination.**—The illumination produced by a single-point source of light, varies inversely as the square of the distance from that source.

**Law of Ohm.**—(1) The law of non-varying current strength in a circuit not subject to variation. (2) Ohm's law.

**Law of Volta.**—(1) The law of contact series. (2) Volta's law.

**Laws of Becquerel.**—Laws for the magneto-optic rotation of the plane of polarization.

**Laws of Coulomb.**—Laws for the force of attraction and repulsion existing between charged bodies, or between neighboring magnet poles.

**Laws of Faraday.**—Laws of electrolytic decomposition.

**Laws of Joule.**—Laws expressing the development of heat in a circuit by an electric current.

**Laws of Reflection.**—(1) The angle of incidence is equal to the angle of reflection. (2) Both the incident and the reflected rays lie in the same plane.

**Lay.**—The helical disposition of wires in a strand or sheath, in which each wire makes a complete revolution about the axis.

**Lay Torpedo.**—A moving torpedo, in which the motive power is either carbonic acid gas or compressed air, and the guiding power electricity.

**Layer.**—A name sometimes applied to an electro-plating deposit.

**Lay-Out of Cable in Tank.**—(1) The starting of a new flake in coiling a cable in a tank, by proceeding from the eye at the end of the finished flake, directly outward to the edge of the tank. (2) That part of a cable which connects the inside of one flake with the outside of the succeeding flake in a cable tank.

**Laying-Up Cables.**—Placing or disposing separate cables or conductors in a bunched cable.

**Lead.**—(1) An insulated conductor leading to or from an electric source. (2) In telegraphy, an insulated conductor leading to an instrument, battery, circuit, or station. (3) In a multiple or parallel-connected circuit, a conductor or main connected to the positive terminal of the source. (4) In a system of electric distribution, an insulated conductor leading to a main, feeder, source, station, testing apparatus, or device. (5) A connecting wire.

**Lead Accumulator.**—An accumulator or storage cell which has been formed from two plates of lead immersed in dilute sulphuric acid.

**Lead Burning.**—Effecting a metallic junction between two lead plates or strips by partially fusing them together.

**Lead-Covered Conductors.**—Insulated conductors sheathed in lead.

**Lead-Encased Cable.**—A cable provided with a sheathing or coating of lead on its external surface.

**Lead of Brushes of Dynamo-Electric Generator.**—An angular deviation from the normal position, forwards, or in the direction of rotation of the armature, which is given to the brushes on the commutator, in order to obtain sparkless commutation.

**Lead of Current.**—An advance in the phase of an alternating current beyond that of the electromotive force producing the current.

**Lead of Motor Brushes.**—The angular displacement from the normal position in the direction contrary to that of the rotation of the armature, which it is necessary to give the brushes of an electric motor, when its lead is increased, in order to obtain freedom from sparking.

**Lead Scoring Tool.**—A tool for readily scoring the surface of a lead-covered cable, for the purpose of obtaining a clean surface preparatory to making a joint.

**Lead Sheathing.**—The coating of lead placed on the outside of a lead-covered cable.

**Lead Sleeve.**—A lead tube provided for making a joint in a lead-covered cable.

**Lead-Tin Alloys.**—Alloys of lead and tin, of low melting point, employed for safety fuses.

**Lead Tree.**—An arborescent deposit of lead obtained by the electrolysis of a solution of a lead salt.

**Lead Voltameter.**—A voltameter consisting of lead electrodes immersed in a dilute solution of sulphuric acid and water.

**Leadod Cable.**—A cable provided with a lead sheathing.

**Leading Current.**—An alternating-current wave or component, in advance of the electromotive force producing it.

**Leading Edge of Pole-Pieces of Armature.**—Those edges or terminals of the field magnet pole pieces which the armature is approaching in its rotation.

**Leading Horn of Pole-Pieces of Dynamo.**—Those edges or terminals of the field-magnet pole-pieces towards which the armature of a dynamo-electric machine is carried during its rotation.

**Leading In Insulator.**—The insulator provided for the support of the wires leading into a building from an aerial circuit.

**Leading-In Tube.**—(1) A tube of insulating material provided for the reception

of the leading-in wires in a building.  
(3) An insulating tube.

**Leading-In Wires.**—(1) The wires that pass from an aerial circuit into a house or building. (2) The wires or conductors which lead the current through an incandescent electric lamp; i.e., into and out of a lamp. (3) Wires leading a circuit into a house, room, box, or apparatus.

**Leading Pole of Dynamo or Motor.**—The pole of a dynamo or motor approached by points on the surface of the revolving armature which lie between the poles at any instant.

**Leading-Up Wires.**—Wires employed for raising an aerial cable to the cable hangers.

**Leads.**—(1) In a system of parallel distribution, the conductors connected to the positive and negative terminals of a source. (2) Generally, the conductors in any system of electric distribution. (3) Conductors which lead the current to or from any source, circuit or device. (4) In electric testing the insulating conductors leading the testing current to the circuit or conductor tested.

**Leak.**—(1) Any loss or escape by leaking. (2) The point or place where a leak occurs.

**Leakage.**—A loss or escape by leaking.

**Leakage Conductance.**—Insulation conductance, or the reciprocal of the insulation resistance.

**Leakage Conductor.**—(1) A conductor placed on a telegraphic circuit for the purpose of preventing the disturbing effects of leakage into a neighboring line by providing a direct path for such leakage to the earth. (2) A conductor placed on a telegraphic line for the purpose of lessening the retardation of the line by assisting in its discharge.

**Leakage Current of Primary.**—(1) The magnetizing current which flows into the primary circuit of a transformer when the secondary circuit is open. (2) A current employed in magnetizing only, as distinguished from a current usefully transformed.

**Leakage Current of Transformer.**—(1) The current which flows into the primary circuit of a transformer when the secondary circuit is opened. (2) The magnetizing current.

**Leakage Drop.**—The drop produced in a circuit by leakage.

**Leakage, Electric.**—The gradual dissipation of a charge or current due to insufficient insulation.

**Leakage Factor.**—In a dynamo-electric machine, the ratio of the total flux, which passes through the field-magnet cores of a dynamo or motor, to the total useful flux passing from them through the armature.

**Leakage Flux.**—(1) That portion of the field flux which does not pass through the armature of a dynamo or motor, and which, therefore, produces no useful effect. (2) The stray flux, or that from which no useful effect is obtained.

**Leakage Indicator.**—(1) A magnetic explorer. (2) An electric testing apparatus for revealing the presence of leakage in any circuit or system.

**Leakage Interference.**—Interference between two or more circuits due to their mutual leakage.

**Leakage Magnetic Resistance.**—The reluctance to leakage magnetic flux.

**Leakage Method of Measuring Insulation.**—A method of measuring the insulation of a conductor or condenser by determining the rate at which it loses charge by leakage.

**Leakage Paths.**—The paths traversed by leakage magnetic flux.

**Leakance.**—A term proposed for leakage-conductance in a circuit.

**Leclanché's Voltaic Cell.**—A zinc-carbon couple whose elements are used in connection with a solution of sal-ammoniac, and a quantity of finely divided black oxide of manganese surrounding the carbon.

**Lecture Galvanometer.**—A form of galvanometer suitable for showing the movements of a galvanometer needle to an audience at a considerable distance from the instrument.

**Left-Hand Trolley-Frog.**—A trolley-frog so arranged as to switch a car to the left.

**Left-Hand Trolley-Switch.**—A switch arranged to divert a car to the left of a main line.

**Left-Handed Armature-Windings.**—Armature windings applied to the core in a left-handed or sinistral helix.

**Left-Handed Dynamo.**—A dynamo which runs left-handedly, or counter-clockwise, when regarded from the pulley end.

**Left-Handed Helix.**—(1) A left-handed solenoid. (2) A helix wound left-handedly, or counter-clockwise.

**Left-Handed Motor.**—A motor which runs left-handedly, or counter-clockwise, when regarded from the pulley end.



**Left-Handed Rotation.**—A rotation in a positive or counter-clockwise direction.

**Left-Handed Solenoid.**—A solenoid whose winding is left-handed, or counter-clockwise.

**Left-Handed Spiral.**—A left-handed helix.

**Left-Handed Winding.**—The winding of a solenoid or helix in a counter-clockwise direction.

**Leg.**—In a system of telephonic exchange, where a ground-return is used, a single wire; or, where a metallic circuit is employed, two wires, provided for connecting the subscriber with the main switch-board, so that any subscriber may be placed directly in circuit with two or more other subscribers.

**Leg Key.**—A Morse telegraphic key having long screw in its base for passing through a table.

**Leg of Circuit.**—(1) A branch of a bifurcated or divided circuit. (2) A loop or offset in a series circuit.

**Leg of Electro-Magnet.**—One of the cores of an electro-magnet.

**Legal Earth Quadrant.**—(1) A practical unit of inductance as defined by the Electrical Congress of 1884, at Paris, and as distinguished from the true earth quadrant. (2) The legal quadrant.

**Legal Ohm.**—(1) An ohm whose value is in accordance with the definition of the Electrical Congress of 1884, in Paris. (2) The resistance of a uniform column of mercury one square millimetre in area of cross-section, and 106 centimetres in length, at the temperature of 6° Cent., or 32° Fahr. (3) The concrete standard ohm as defined by the Electrical Congress of 1884, at Paris, as distinguished either from the B. A. ohm, the true ohm, or the International ohm.

**Legal Quadrant.**—(1) The legal earth quadrant. (2) The unit of self-induction based upon the definitions of the Electrical Congress of 1884, in Paris.

**Legged.**—Placed in a circuit by means of a leg.

**Legging Key-Board.**—A key-board employed for the purpose of legging an operator into a circuit containing two or more subscribers.

**Legless Key.**—(1) A name sometimes given to a Morse telegraphic key provided with a flat base. (2) A self-closing key.

**Length of Spark.**—The air distance traversed by a disruptive discharge.

**Lenard Effect.**—The effect produced by

the Lenard Rays, in causing fluorescence, and in passing through some substances that are opaque to light.

**Lenard Rays.**—The peculiar radiation emitted from that external portion of a Lenard tube that is directly opposite the cathode.

**Lenard Tube.**—A form of high-vacuum tube provided with an aluminium plate, hermetically sealed in that portion of the wall of the tube lying directly opposite the cathode, and employed for producing Lenard rays.

**Lens.**—A medium, transparent to radiant energy, provided with a curved face or faces, and employed to bring a beam or pencil of light to a single point or focus.

**Lens Lamp.**—An incandescent lamp provided with a small lens hermetically fixed in a portion of its wall, opposite a suitably placed reflector.

**Lens-Mirror Projector.**—A form of projector whose operation is dependent on the combined action of a mirror and a lens.

**Lenz's Laws.**—Laws for determining the direction of currents produced by electrodynamic induction.

**Lesser Calorie.**—(1) The small calorie. (2) The therm. (3) The water-gramme-degree-centigrade.

**Letter-Box, Electric.**—A device that announces the deposit of a letter in a box by the ringing of a bell, or by the moving of a needle or index.

**Letter Printing Instrument.**—A type-printing telegraphic instrument.

**Level, Electric.**—An equipotential electric surface.

**Level of Earth, Electric.**—A term sometimes employed for the potential of the earth.

**Lever Brake for Car.**—A form of car brake operated by means of a brake handle.

**Lever Hook.**—(1) The hook in an automatic telephone switch on which a telephone receiver is hung when not in use. (2) A contact lever provided with a hook for supporting a telephone.

**Lever Switch.**—(1) A switch mounted upon a fulcrum axis like a lever. (2) A switch operated by the movements of a lever. (3) A telephone switch of a multiple telephone switch-board, operated by a lever.

**Leyden-Jar.**—A condenser in the form of a jar, in which the metallic coatings are placed opposite each other respectively on the outside and inside of the jar.



**Leyden-Jar Battery.**—The combination of a number of separate Leyden jars so as to act as a single jar.

**Leyden-Jar Discharge.**—(1) The disruptive discharge produced by a Leyden jar. (2) A name sometimes given to an oscillatory discharge.

**Leydie Resistance.**—A term proposed for the resistance offered by various metallic circuits to condenser discharges.

**Lichtenberg's Dust-Figures.**—Figures obtained by writing on a sheet of shellac with the knob of a charged Leyden jar, and then sprinkling over the sheet, dried, powdered sulphur and red lead, which have been previously mixed together and are thereby rendered respectively negative and positive.

**Lichtenberg's Electric Figures.**—A term sometimes applied to Lichtenberg's dust-figures.

**Life Curve of Incandescent Electric Lamp.**—A curve in which the life of an incandescent electric lamp is represented by means of abscissæ and ordinates that are respectively equal to the life in hours and the candle-power at constant pressure, or the pressure at constant candle-power.

**Life of Electric Incandescent Lamp.**—The number of hours that an incandescent electric lamp will continue to furnish a good commercial light when operated at normal pressure.

**Lift, Electric.**—An electrically operated lift or elevator.

**Light.**—(1) That particular form of radiant energy by means of which objects are rendered visible. (2) The flow or flux of light emitted from a luminous source.

**Light Bath, Electric.**—A form of electro-therapeutic bath in which the patient is exposed to the radiation of a number of incandescent lamps.

**Light Cell.**—A term sometimes employed for a photo-electric cell.

**Light, Electric.**—Light produced by the action of electric energy.

**Light Escape.**—A partial ground or earth.

**Light-House Illumination, Electric.**—The application of the electric arc-light to light-houses.

**Light Indicator of Railroad Signal.**—A device by means of which an indication is given electrically, at a distance, as to whether a signal lamp is lighted or not.

**Light Load of Machine.**—A partial load, or a load which is small by comparison with the capacity of the machine.

**Light Cable, Electric.**—A cable employed for furnishing the current required for the maintenance of electric lights.

**Lighting Circuits.**—Any electric circuit for the distribution of light.

**Lightning.**—A spark or discharge that results from the disruptive discharge of a cloud to the ground, or to a neighboring cloud.

**Lightning Arrester.**—A device by means of which the apparatus placed in any electric circuit is protected from the destructive effects of a flash or discharge of lightning.

**Lightning - Arrester Board.**—The board to which the lightning arresters of a system of telephonic or telegraphic communication are connected.

**Lightning-Arrester Earth.**—The earth provided for the grounding of the earth-plate of a lightning arrester.

**Lightning Bolt.**—A lightning flash or discharge.

**Lightning Conductor.**—A lightning rod.

**Lightning Deviator.**—A term sometimes used for lightning arrester.

**Lightning Discharger.**—A term sometimes used for lightning protector.

**Lightning Flash.**—A lightning discharge.

**Lightning Guard.**—A term sometimes used for lightning rod.

**Lightning Jar.**—A Leyden-jar whose coatings consist of metallic filings in the gaps between which an irregular series of sparks, somewhat resembling a lightning flash, appear on the discharge of the jar.

**Lightning Rod.**—A rod, strap, wire, or stranded cable, of good conducting material, placed on the outside of a house or other structure, in order to protect it from the effects of a lightning discharge.

**Lightning Rods for Ships.**—A system of rods or conductors designed to afford electric protection for vessels at sea.

**Lightning Stroke.**—(1) A disruptive discharge occurring between two oppositely charged clouds, or between a cloud and the earth. (2) A lightning flash.

**Lightning Tube.**—A fulgurite.

**Lime Light.**—A source of light obtained by the incandescence of a cylinder of lime under the influence of the oxy-hydrogen blow-pipe.

**Limit Switch.**—A small automatic switch on an electric street car, connected in series with the brake discs, and so arranged as to be capable of cutting out the fields of

both motors when the braking current is excessive.

**Limiting Distance of Speech.**—(1) The length of circuit, or the distance to which a circuit may be carried in a straight line, at which telephonic conversation is just practicable. (2) The limiting length of line to which telephonic speech can be carried successfully, depending upon the electric conditions of the circuit, and the nature of the apparatus employed.

**Limiting Speed of Cable.**—The speed to which the transmission of signals through a cable is limited, by reason of its electrostatic capacity and resistance.

**Limiting Stop.**—A stop set so as to limit the motion of an electrically vibrating or oscillating bar to any pre-determined extent.

**Limiting Temperature-Elevation.**—A temperature elevation of any apparatus which is not to be exceeded during its prolonged operation.

**Line.**—Generally, a wire or conductor connecting any distant points or stations.

**Line Adjuster.**—An instrument employed for overcoming the effects of leakage on the adjustment of the relays in a telegraphic circuit.

**Line Arrester.**—The lightning arrester connected to a line or circuit.

**Line Circuit.**—(1) The wires or other conductors in the main line of a telegraphic or other circuit. (2) A transmission circuit for electric energy.

**Line Crosses.**—Electric crosses occurring on lines.

**Line Crossing.**—(1) The place where two overhead trolley conductors cross each other. (2) A metallic plate uniting the ends of trolley wires, where one wire crosses another.

**Line Cross-Over.**—(1) A trolley crossing. (2) A trolley cross-over.

**Line Drop.**—In a telephone switchboard, an electro-magnetic drop connected to a line.

**Line Dynamometer.**—A dynamometer employed during the erection of an overhead line, in order to determine whether it has been pulled up to its proper tension.

**Line Insulator.**—An insulator employed for the support of an aerial line.

**Line Integral.**—A continuous summing up of some instantaneous quantity executed or conducted along a continuous line.

**Line Jacks.**—In a telephone switchboard, a jack connected to a line.

**Line of Least Sparking.**—The diameter of sparkless commutation.

**Line Peg.**—A peg or plug in a switchboard connecting the line with translating devices or with another line.

**Line-Pressure Compensator.**—A device for attachment to a voltmeter in an alternating-current system, whereby the voltmeter indications are compensated for the drop of pressure in the feeder, and are such as would be obtained if the instrument were directly connected to the mains.

**Line Reactance.**—The reactance of a line conductor.

**Line Section of Electric Railroad.**—Any part of a trolley, or other railroad line, so insulated from other parts as to permit of the separate control of its supply of electric power.

**Line Selector.**—A wire selector.

**Line Wire.**—In telegraphy, the wire that connects the different stations with one another.

**Line-Wire Tie.**—A tie wire of soft copper or soft iron employed for holding the line wire to the insulator.

**Lines of Electric-Displacement.**—Lines of electric flux, along which electric displacement takes place.

**Lines of Electric-Induction.**—The lines along which electric induction takes place.

**Lines of Electrostatic-Flux.**—The lines along which electrostatic flux passes.

**Lines of Electrostatic-Force.**—(1) Lines of force produced in the neighborhood of a charged body by the presence of the charge. (2) Lines extending in the direction in which the force of electrostatic attraction or repulsion acts.

**Lines of Inductive-Action.**—Lines of electrostatic force.

**Lines of Magnetic-Force.**—(1) Lines in which magnetic force acts. (2) Lines extending in the direction in which the force of magnetic attraction or repulsion acts.

**Lines of Magnetic-Induction.**—(1) Magnetic flux-paths. (2) The lines in which magnetic induction proceeds.

**Lines of Magnetization.**—(1) A term sometimes applied for lines of magnetic induction. (2) A term sometimes applied to those portions of the lines of magnetic force which lie within the magnetized substance.

**Lineants.**—A term proposed as a unit of magnetic flux in place of webers, and

equal to the pressants divided by the resistants, or to the magneto-motive force divided by the reluctance. (Not used.)

**Linear Capacity.**—The quotient of the capacity of a line or conductor by its length.

**Linear Capacity of Cable.**—The electrostatic capacity of a cable per-unit-of-length.

**Linear Coefficient of Expansion.**—The increase in a unit length of a substance when subjected to unit difference of temperature.

**Linear Density, Electric.**—The amount of electrification per unit of length.

**Linear Density of Charge.**—The density of charge per-unit-of-length.

**Linear Insulation.**—The product of the total insulation of a line by its length.

**Linear Insulation of Cable.**—The product of the insulation resistance of a cable by its length.

**Linear Spectrum.**—A spectrum consisting of a few isolated frequencies.

**Lane-Man.**—One who puts up and repairs line circuits, and attends to the receptive devices connected therewith.

**Link-Fuse.**—A link-shaped leaden plate, provided with suitable ends for connection with the copper fuse-wire terminals.

**Link-Fuse Cut-Out.**—A cut-out employing a link-fuse.

**Linkages.**—In a coil traversed by a current, the sum of the magnetic flux due to that current linked with the coil, obtained by considering the quantity of flux linked with each turn, separately and successively, and adding the fluxes so obtained.

**Linked Magnetic and Electric Circuits.**—A phrase sometimes employed to represent the interlinked condition of magnetic and electric circuits.

**Liquid Compass.**—A form of ship's compass in which the compass-needle is suspended, not only by the usual gimbals, but is also so arranged that its oscillations are checked by a surrounding liquid.

**Liquid Flow.**—The quantity of liquid that escapes from an orifice, or passes through any cross-section of a pipe or channel, in a given time.

**Liquid-Level Alarm, Electric.**—A device for electrically sending an alarm when a liquid level differs materially from a given level.

**Liquid Resistance Load.**—An artificial load for a dynamo consisting of a mass of liquid interposed between suitable electrodes.

**Liquid Thermostat.**—A thermostat whose operation depends on the expansion of a liquid.

**Liquefaction.**—The conversion of a solid into a liquid by the addition of heat, or of a gas into a liquid, either by the removal of heat, or by the combined influence of low temperature and pressure.

**Listening Cam.**—In a telephone system a metallic cam or lever-key by means of which an operator readily places her telephone in circuit with a subscriber.

**Listening Key.**—In a telephone switchboard, a listening cam.

**Lithanode.**—Highly conducting lead peroxide in a solid form suitably prepared for the plate of a storage cell.

**Line Trolley-Crossing.**—(1) The point or place where two trolley wires cross each other at a street crossing. (2) A line crossing.

**Live Wire.**—(1) A wire through which current is passing. (2) A wire connected with an electric pressure or source.

**Liverpool Repeater.**—A name given to a form of telephone repeating induction coil in which the iron core is constructed of thin wires bent around over the coils, so as to overlap at the ends, and form a complete magnetic circuit.

**Load.**—The work thrown on any machine.

**Load-Diagram of Station.**—A curve which represents the output of a station for a given time, say for the twenty-four hours of the day.

**Load-Factor.**—The ratio of the average to the maximum load.

**Load of Dynamo.**—The current delivered by a dynamo.

**Load-Panel.**—The panel of a central-station switchboard provided with apparatus for indicating the total station-load.

**Loadstone.**—An objectionable orthography sometimes employed for lodestone.

**Local Action of Dynamo-Electric Machine.**—The loss of energy in a dynamo by the establishment of eddy currents in its pole-pieces, cores, or other conducting masses.

**Local Action of Voltaic Cell.**—An irregular consumption of the zinc, or positive element of a voltaic cell, by the fluid or electrolyte when the circuit is opened or broken, as well as when it is closed or in regular action.

**Local Battery.**—A voltaic battery thrown into or out of action by a relay and employed at a station on a telegraphic line,



to operate a sounder, or a registering or recording apparatus, at that point only.

**Local Battery Circuit.**—The circuit in a telegraphic system in which is placed the local battery, as distinguished from the main battery.

**Local Calls.**—At a central telephone exchange, a call received from a subscriber connected directly therewith, as distinguished from a call received from another exchange.

**Local Currents.**—A term sometimes used for eddy currents.

**Local Faradization.**—A method of therapeutically applying the voltaic current, similar in general to that employed in local galvanization.

**Local Galvanization.**—The application of galvanization to portions of the body only, in contradistinction to general galvanization.

**Local Jack.**—In a multiple telephone switchboard, an answering jack corresponding to a local line drop, or a jack separated from the main body of the switchboard and set in a local row for the convenience of the operator in answering calls.

**Localization of Faults.**—Determining the position of a fault on a telegraphic line or cable by electrical tests applied at one or both ends.

**Localization Test.**—A test of a faulty circuit made to determine the position of the fault.

**Localized Capacity.**—Capacity inserted in a circuit in one or more condensers, as distinguished from distributed capacity, or that which is present throughout the entire circuit.

**Localized Inductance.**—Inductance inserted in a circuit at one or more points, as distinguished from distributed inductance which is present throughout the entire circuit.

**Localized Vector.**—(1) A vector function of space. (2) A vector point-function. (3) A vector quantity which is a property of every point of a region.

**Locally Inter-Connected Switchboard.** A switchboard sub-divided into sections, each provided with auxiliary jacks which are interconnected among the different sections.

**Lock, Electric.**—A lock that is automatically released by the aid of a distant push-button.

**Locomotive, Electric.**—(1) A locomotor whose motive power is electricity. (2) An electrically-driven locomotive engine.

**Locomotive Head-Light, Electric.**—An electric light placed in the focus of a parabolic reflector in front of a locomotive engine.

**Locomotor.**—A travelling motor, as distinguished from a stationary motor.

**Locomotor, Electric.**—An electrically driven locomotor.

**Lodestone.**—A name given to a piece of naturally magnetized iron ore.

**Lodge's Standard Voltaic Cell.**—A standard form of Daniell's cell.

**Log, Electric.**—An electric device for measuring the speed of, or the distance traversed by, a vessel.

**Logarithm.**—The exponent, or the power to which it is necessary to raise a fixed number called the base, in order to produce a given number.

**Logarithmic.**—Of or pertaining to a logarithm.

**Logarithmic Curve.**—A curve in which the rate of increase or decrease of the ordinate is proportional to the ordinate itself.

**Logarithmic Decrement of Galvanometer.** (1) In a series of galvanometer swings or deflections, the ratio of any pair of successive amplitudes. (2) The ratio of any two successive total swings or deflections of a galvanometer needle.

**Logging Motor, Electric.**—(1) An electric locomotor employed for hauling logs. (2) A form of trolley motor moving over a cable way, usually over a swanp, for hauling logs out of the same.

**Long-Arc System of Electric Lighting.** A system of arc lighting employing long arcs and, consequently, high electromotive forces.

**Long-Closed Circuit.**—A series circuit in which all the devices are included as distinguished from a series circuit in which some of the electro-receptive devices are cut-out.

**Long-Coil Magnet.**—(1) An electro-magnet whose magnetizing coil consists of many turns of fine wire. (2) A high-resistance magnet.

**Long-Connection Armature-Winding.** Such a connection of a two-circuit armature winding that in each circuit electromotive forces are produced by field poles of one polarity only.

**Long Connection of Two-Circuit Gramme-Windings.**—A form of Gramme winding in which the two circuits from brush to brush consist of conductors that are influenced by only one-half the poles.



**Long-Core Electro-Magnet.**—An electro-magnet with a long core.

**Long-Distance Carbon Telephone Transmitter.**—A form of microphonic telephone transmitter suitable for use on long-distance circuits.

**Long-Distance Telephone Cabinet.**—An approximately sound-tight cabinet employed for convenience and secrecy in telephonic communication.

**Long-Distance Transmission.**—Transmission of electric energy over fairly considerable distances.

**Long End of Quadruplex Battery.**—The end of a quadruplex battery that is further from the point of intermediate connection than the short end.

**Long-Range Electrometer.**—An electrometer the range of whose scale is comparatively long.

**Long-Shunt Compound-Winding.**—A compound winding of a dynamo-electric machine in which the shunt coil is connected directly, or through resistance, with the terminals of the machine, as distinguished from a short-shunt compound-winding.

**Long-Shunt Compound-Wound Dynamo-Electric Machine.**—A compound-wound dynamo, in which the shunt-field magnet coils form a shunt to the binding posts of the machine.

**Longitudinal Magnetization.**—Such a magnetization of a bar or rod, that its separate magnetic particles are arranged with their axes lying in the direction of the length of the bar.

**Longitudinal Vibrations.**—Vibrations set up in an elastic medium in the direction of propagation or transmission, as distinguished from transverse vibrations which occur at right angles to the direction of propagation.

**Loom, Electric.**—An electrically operated loom, in which the Jacquard cards of the ordinary loom are replaced by simple perforated metal plates, whose perforations correspond to those in the Jacquard cards.

**Loop Bracket.**—(1) A insulating bracket from which a conducting loop can conveniently be run so as to include a source or translating device. (2) A bracket for holding two insulators and wires, such as might form a loop.

**Loop-Break.**—A device for introducing a loop in a break made at any part of a circuit.

**Loop-Circuit.**—(1) A term sometimes applied to a circuit in parallel or multiple-arc. (2) A metallic circuit. (3) A circuit

having two wires, one out-going and the other returning, as distinguished from an earth-return circuit.

**Loop Cut-Out.**—A cut-out placed in a loop.

**Loop, Electric.**—A portion of a main circuit consisting of a wire going out from one side of a break in the main circuit and returning to the other side of the break.

**Loop-Mile.**—(1) A mile of going and return conductor in a loop circuit. (2) A mile of double conductor. (3) A double mile of conductor. (4) A distance of one mile traversed by a pair of conductors.

**Loop or Spreader Bracket.**—A bracket used on cross-arms for taking off loops that are to be carried to service wires, branch mains, or transformers.

**Loop Switch.**—A switch for opening or closing a loop, or for throwing the loop into or out of a main circuit. (2) A switch for connecting a branch office with a duplex or quadruplex switch at a main office, so that the branch office assumes control of one set of apparatus; i. e., sends and receives messages on the duplex or quadruplex system.

**Loop System of Distribution.**—A system of distribution employed in the early history of electric lighting, in which each of a number of lamps was furnished with current through a single machine by means of a separate and independent loop or circuit connected with the terminals of such machine.

**Loop-System of Parallel Distribution.**—A system of parallel distribution in which a pair of mains is connected to a generator in a manner designed to equalize the drop of pressure; one main being connected at the home end directly to the generator, and the other being connected at its distant end to the generator through a separate wire.

**Loop Test.**—A localization test for a fault in a loop of two telegraphic wires, or in a complete metallic circuit.

**Loop Winding.**—A term sometimes used for lap-winding.

**Loop-Winding of Alternator.**—(1) Coil winding. (2) An alternator armature-winding in which the wire is laid on the surface of the armature core in loops or coils.

**Loops of Force.**—A term sometimes applied for lines of force.

**Loops of Induction.**—A term sometimes applied for lines of magnetic induction.

**Loops of Mutual-Induction.**—Loops or lines of induction produced in any cir-

cuit by variations in the intensity of the current flowing in a neighboring circuit.

**Looping-In.**—A term sometimes employed for a method adopted in grounded telephone or telegraph circuits for connecting several instruments in series in a loop in that circuit, so that any conversation must be transmitted through all the instruments which happen to be in the circuit between the parties connected.

**Loss Plate of Voltmeter.**—(1) That plate of a voltmeter from which the metal is electrolytically dissolved during the passage of the current. (2) The plate connected with the anode or positive terminal.

**Loose Carbon Transmitter.**—(1) A telephone transmitter employing loose carbon or carbon dust. (2) A dust telephone transmitter.

**Loose Contact.**—A contact effected by two or more surfaces that rest loosely on one another, or by means of their weight only.

**Loose-Handle Switch.**—A form of switch in which the handle after it has been moved a short distance falls into a new position of equilibrium.

**Loss of Continuity.**—A disconnection or interruption of a circuit.

**Loud-Speaking Telephone.**—(1) A name given to any telephone characterized by the intensity of the sounds produced by its receiver. (2) A name sometimes given to the electro-motographic telephone.

**Loudness.**—That quality of a sound which depends on the amplitude of its vibrations.

**Low-Frequency.**—(1) A frequency of but comparatively few alternations per second. (2) Any frequency lower than that usually employed.

**Low-Frequency Transformer.**—A transformer designed for operation on a low-frequency circuit.

**Low-Potential Current.**—A term sometimes used for a current on a low-pressure circuit.

**Low-Potential System.**—In the National Electric Code, a system having a pressure less than 3000 volts.

**Low Pressure.**—A comparatively small pressure or electromotive force.

**Low-Pressure Circuit.**—A circuit designed for use in connection with low electric pressure.

**Low-Pressure Incandescent Lamp.**—An incandescent lamp whose filament is short and thick, and, consequently, of

low electric resistance suited for a low pressure.

**Low-Resistance Magnet.**—A magnet wound with low-resistance magnetizing coils.

**Low-Speed Electric Motor.**—An electric motor designed to run normally at low speeds.

**Low Tension.**—A term sometimes used for low pressure.

**Low-Tension Bus.**—In a central station any bus-bar connected with a low-tension generator.

**Low-Tension Electric Fuse.**—A fuse that is ignited by heating a wire to incandescence by the passage of an electric current of low pressure, as distinguished from a high-tension fuse.

**Low-Tension Switch.**—A switch designed for use on low-tension circuits.

**Low Vacuum.**—(1) A vacuum in which the mean-free-path of the molecules of the residual gas is small as compared with the dimensions of the containing vessel. (2) A space from which only a portion of the air or residual gas has been removed.

**Loxodograph.**—An apparatus for electrically recording on paper the actual course of a ship, by the combined action of magnetism and photography.

**Lubricating.**—Reducing friction by means of lubrication.

**Lubrication.**—The reduction of friction between surfaces, by rendering them slippery.

**Luces.**—A plural of lux.

**Lumen.**—(1) A unit of flux-of-light equal to the light received by a square meter of spherical surface, from a point source of unit intensity, placed at the centre of a sphere one metre in radius. (2) The flux of light through a steradian from a point source, whose intensity is one pyr. (3) A pyr-steradian.

**Lumen-Meter.**—An instrument for measuring the flux of light.

**Lumen-Second.**—A rad.

**Lumination.**—A term proposed for illumination. (Not in use.)

**Luminescence.**—A limited power of emitting light possessed by certain bodies which have previously acquired potential energy by exposure to light or radiant energy.

**Luminescence Lamp.**—(1) A fluorescent lamp. (2) A lamp rendered luminescent by bombardment. (3) An X-ray lamp. (4) A vacuum-tube lamp.

**Luminiferous.**—Bearing or carrying light.

**Luminosity.**—A term sometimes used for the brightness of a source.

**Luminous Absorption.**—The absorption of luminous energy in its passage through bodies.

**Luminous Efficiency.**—The ratio which the luminous radiation emitted by a source bears to the total radiant energy emitted by such source in a given time.

**Luminous Flux.**—A phrase sometimes employed for flow of light.

**Luminous Frequencies.**—Physiologically effective frequencies, or those capable of producing the sensation of light.

**Luminous Heat.**—Heat radiation accompanied by or containing physiologically effective frequencies.

**Luminous Intensity.**—The amount of visible radiation emitted from a luminous source per unit-of-area of surface.

**Luminous Interference.**—Interference produced by light waves of the same frequency when out of phase with each other.

**Luminous Radiation.**—Radiation capable of affecting the eye.

**Lummer-Brodhun Screen.**—A form of photometric screen requiring the use of

but one eye, thus eliminating any errors due to the varying sensibility of the two eyes, each of the two sources of light that are being compared illuminating its own field only, and these two fields being presented to the eye as a disc and circle respectively, the latter surrounding the former, and yet having a sharp line of separation from it.

**Lunar-Inequality of Earth's Magnetic Variation.**—Small changes in the value of the magnetic variation or inclination, dependent on the position of the moon as regards the magnetic meridian.

**Lunar-Inequality of Earth's Magnetism.**—Small variations in the value of the earth's magnetic elements dependent on the position of the moon as regards the magnetic meridian.

**Lux.**—(1) A unit of illumination equal to the light received on each square metre of the interior of a sphere whose radius is one metre, from a bougie-decimale placed at its centre. (2) An illumination equal to a lumen-per-square-metre. (3) The normal illumination produced by one candle at a distance of a metre.

**Lux-Second.**—(1) The time-illumination of one lux during one second. (2) A unit of time-illumination employed in photography. (3) A phot.

## M

**M.**—A contraction sometimes employed to express a pressure of the millionth of an atmosphere.

**m.**—A symbol for magnetic moment.

**m.**—A symbol for strength of magnetic pole.

**m.**—An abbreviation for metre, a practical unit of length.

**m.**—An abbreviation for minute, a practical unit of time.

**$\mu$ .**—A symbol for magnetic permeability or inductivity. (International notation.)

**$\mu$ .**—A symbol for micron, the millionth of a metre, or one thousandth of a millimetre.

**$\mu\mu$ .**—A symbol for micron, the millionth of a millimetre, or thousandth of a micron.

**m<sup>2</sup>.**—An abbreviation for square metre, a practical unit of surface.

**m<sup>3</sup>.**—An abbreviation for cubic metre, a practical unit of volume.

**m.a.**—A contraction for milli-ampere.

**m : s.**—An abbreviation proposed for metre-per-second, a practical unit of velocity.

**m : s<sup>2</sup>.**—An abbreviation proposed for metre-per-second-per-second, a unit of acceleration.

**mm.**—A contraction for millimetre.

**M. Current.**—A term proposed for mean current.

**M. M. F.**—A contraction for magneto-motive force.

**M. P.**—A contraction for man-power.

**M. P. H.**—A contraction sometimes employed in railroad work for miles-per-hour.

**M. S. Current.**—A term proposed for mean-square-current.

**Mac or Mack.** A term at one time proposed for the practical unit of self-inductance, after Maxwell.

**Machine Seal of Lamp Chamber.**—A hermetical seal effected mechanically be-



tween the glass support of an incandescent lamp and the walls of the lamp chamber.

**Machine Telegraphic Transmission.**—High-speed telegraphic transmission effected by means of an automatic telegraphic transmitter.

**Machine Telegraphy.**—Automatic or high-speed telegraphy.

**Machine Tool, Electric.**—An electrically driven machine tool.

**Made Circuit.**—A completed circuit.

**Magazine Fuse.**—A safety fuse containing a number of spare fuses, so arranged as to readily permit the replacement of the fuse when blown, either automatically, or by hand.

**Magic Pane.**—A condenser formed of a sheet of glass, covered on one side with pieces of tin-foil, with small spaces left between them disposed in some design on the glass, which design becomes luminous on the discharge of the condenser.

**Magne-Crystallic Action.**—A term proposed by Faraday to express differences in the action of magnetism on crystalline bodies in different directions.

**Magne-Crystallic Force.**—The force which produces magne-crystallic actions.

**Magne-Electric Induction.**—A variety of electro-dynamic induction in which electric currents are produced by the motion of permanent magnets past conductors, or of conductors past permanent magnets.

**Magnet Stone.**—An old name for magnetite or for a natural magnet.

**Magnet.**—(1) Any body producing magnetic flux. (2) A body possessing the power of attracting the unlike pole of another magnet, or of repelling the like pole, or of inducing magnetism in magnetizable bodies.

**Magnet Coil.**—A coil of insulated wire surrounding the core of an electro-magnet, through which the magnetizing current is passed.

**Magnet Cores.**—Bars or cylinders of iron on which the magnetizing coils of wire are placed.

**Magnet Operation.**—The use of a magnet for the purpose of removing particles of iron from the eye.

**Magnetic or Magnetical.**—Of or pertaining to a magnet.

**Magnetic A-B-C-Instrument.**—A step-by-step telegraph instrument employing magneto-induced currents.

**Magnetic Adherence.**—Adhesion be-

tween surfaces, due to their mutual magnetic attractions.

**Magnetic Anisotropy.**—A difference in the magnetic susceptibility of a mass of iron in different directions.

**Magnetic Air-Circuit.**—That portion of a magnetic circuit which passes wholly through air.

**Magnetic Air-Gap.**—Any gap in an aeriform magnetic circuit filled with air.

**Magnetic Alternator.**—A magneto-alternator.

**Magnetic Atmosphere.**—(1) A term formerly employed for a space filled with the assumed magnetic effluvia. (2) A magnetic field.

**Magnetic Attraction.**—The mutual attraction exerted between unlike magnetic poles.

**Magnetic Axis.**—(1) The line along which a magnetic needle, free to move, but which has come to rest in a magnetic field, can be turned without changing the direction in which it comes to rest. (2) The line connecting the poles of a bar magnet or needle.

**Magnetic Axis of Straight Needle.**—A straight line drawn through a magnetic needle joining its poles.

**Magnetic Azimuth.**—(1) The arc intercepted on the horizon, between a magnetic meridian and a great circle passing through the observed body. (2) A magnetic bearing.

**Magnetic Battery.**—The combination of a number of separate magnets so as to be capable of acting as a single magnet.

**Magnetic Bearing.**—The horizontal angle included between a horizontal line from an observer's eye to an object and the observer's magnetic meridian.

**Magnetic Bearing Compass.**—A compass provided with means for taking bearings.

**Magnetic Belting.**—A method of driving machinery in which the belt is provided at frequent intervals with strips of sheet iron riveted to it perpendicularly to its length and the iron driving pulley magnetized, so that the magnetic attraction increases the friction or grip on the pulley.

**Magnetic Blow-Out.**—(1) A device for extinguishing an arc by an electro-magnet. (2) A device employed for extinguishing an arc formed between the contact pieces of a street-car controller, or other similar device, by means of the flux produced by an electro-magnet which is placed in the circuit of the current producing the arc.



**Magnetic Blow-Out Lightning-Arrester.**—A lightning arrester in which the arc, when formed, is blown out by the action of the flux of an electro-magnet placed in the circuit of the arc.

**Magnetic Bridge.**—An apparatus for measuring magnetic resistance, similar in principle to Wheatstone's electric bridge.

**Magnetic Centre of Gravity.**—A conception respecting the existence of a point from which the magnetic flux producing a magnet pole issues, similar to the conception of a centre of gravity in an unequally loaded plane.

**Magnetic Circuit.**—The path through which magnetic flux passes.

**Magnetic Circuit-Breaker.**—A circuit breaker operated by means of an electro-magnet.

**Magnetic Circuit-Closer.**—A circuit closer operated by means of an electro-magnet.

**Magnetic Closed-Circuit.**—A ferro-magnetic circuit.

**Magnetic Clutch.**—(1) A form of clutch in which magnetic attraction is substituted for ordinary mechanical force, to obtain the friction required in the clutch. (2) A clutch operated electro-magnetically.

**Magnetic Coercivity.**—A term sometimes used for coercive force.

**Magnetic Compensator.**—A device for neutralizing the effects produced by the local magnetism of a ship on a magnetic needle.

**Magnetic Concentration.**—The separation of the useful ore from the dross in low-grade ores, by the use of an electro-magnetic separator.

**Magnetic Conduction-Current.**—(1) Time-rate of increase of magnetic flux through a boundary. (2) Time-rate of flow of magnetism.

**Magnetic Conductivity.**—Magnetic permeability.

**Magnetic Connection.**—(1) A term sometimes employed for inductive connection. (2) The connection of one circuit with another by means of inter-linked magnetic flux.

**Magnetic Control of Galvanometer Needle.**—The alteration in the sensibility of a galvanometer needle effected by means of a compensating magnet.

**Magnetic Couple.**—The couple which turns or tends to turn a magnetic needle, placed in the earth's field, into the plane of the magnetic meridian.

**Magnetic Creeping.**—A term used for a gradual increase in the magnetization, following a sudden increase in magnetizing force.

**Magnetic Cross-Flux of Transformer.**—A magnetic flux across the direction of main or working flux and representing magnetic leakage.

**Magnetic Current.**—The time-rate of increase of magnetic flux through a surface.

**Magnetic Curve-Tracer.**—An instrument for graphically recording the variations of magnetic intensity in a mass of iron subjected to cyclic variations of magnetizing force.

**Magnetic Curves.**—(1) Curved lines extending in the direction of the flux-paths of a magnetic field, obtained by gently tapping a sheet of paper or glass sprinkled with iron filings and held in the field. (2) Magnetic figures.

**Magnetic Cycle.**—A cycle of magnetization.

**Magnetic Day of Disturbance.**—A day of magnetic disturbance.

**Magnetic Declination.**—The variation of a magnetic needle from the true geographical north.

**Magnetic Deep-Sea Thermometer.**—A deep-sea thermometer containing small steel maximum and minimum limit markers which are reset by a permanent magnet.

**Magnetic Density.**—The strength of magnetism as measured by the amount of magnetic flux which passes through unit area of normal cross-section. (2) Intensity of magnetic induction.

**Magnetic Deviation.**—(1) The local magnetic variation due to the presence of iron in the vicinity, as distinguished from the true magnetic variation of the locality considered. (2) On board ship, that part of the total magnetic variation due to iron in or on board the ship.

**Magnetic Diffusion.**—Magnetic leakage.

**Magnetic Dip.**—(1) The deviation of a freely suspended magnetic needle from a true horizontal position. (2) The magnetic inclination.

**Magnetic Discontinuity.**—The more or less marked change in the permeability of a magnetic circuit produced by any joint in such circuit.

**Magnetic Displacement.**—(1) An imaginary stress in the ether when subjected to magnetization and corresponding to electric displacement in electrostatics. (2) Magnetic induction.

**Magnetic Dissymmetry.**—(1) A lack of uniformity of the magnetic flux in a magnetic circuit, or in portions of that circuit. (2) A lack of uniformity produced in the flux through the armature core of a dynamo or motor during its operation.

**Magnetic Disturbance.**—A term sometimes employed for temporary variations in the intensity of the earth's magnetism.

**Magnetic Divining Rod.**—A small dipping needle employed for the purpose of locating approximately the position of beds of iron ore.

**Magnetic Effluvia.**—(1) A term employed in the early history of magnetism for assumed imponderable effluvia which were supposed to be given off by magnets. (2) Magnetic flux.

**Magnetic Elements of a Place.**—The values of the magnetic intensity, the magnetic declination or variation, and the magnetic inclination or dip of any place.

**Magnetic Equalizer.**—A device for equalizing the otherwise unequal force exerted between a magnet pole and its armature at varying distances.

**Magnetic Equator.**—(1) The line connecting places on the earth's surface where a magnetic needle remains horizontal, when suspended so as to be free to move in a vertical as well as in a horizontal plane. (2) An irregular line passing around the earth, approximately midway between its magnetic poles.

**Magnetic Excitation.**—Magnetization.

**Magnetic Explorer.**—(1) A small flat coil of insulated wire, used, in connection with the circuit of a galvanometer or telephone, to determine the position and extent of the magnetic leakage of a dynamo, or other similar apparatus. (2) A search coil so connected to a ballistic galvanometer that its movements through magnetic flux will be indicated by the galvanometer.

**Magnetic Fatigue.**—An increase in the hysteretic coefficient of iron due to an assumed fatigue after many cyclic reversals.

**Magnetic Fatigue of Transformer.**—(1) An increase in the hysteretic loss of a transformer with time. (2) The ageing of a transformer core.

**Magnetic Field.**—(1) The region of magnetic influence surrounding the poles of a magnet. (2) The space or region traversed by magnetic flux. (3) A space traversed by magnetic flux in which a

magnet needle, free to move, will assume a definite position.

**Magnetic Figures.**—A name sometimes applied to the groupings of iron filings obtained when a sheet of paper or glass, sprinkled with filings, is so held in a magnetic field as to permit the filings to be grouped or arranged under the influence of the magnetic flux.

**Magnetic Filament.**—A polarized line or chain of ultimate magnetic particles.

**Magnetic Flow.**—A term sometimes employed for magnetic flux.

**Magnetic Fluids.**—A term formerly employed for the assumed fluids which were believed to be the cause of magnetic phenomena.

**Magnetic Austral Fluid.**—The assumed magnetic fluid existing at the south pole of any magnet.

**Magnetic Boreal Fluid.**—The assumed magnetic fluid existing at the north pole of any magnet.

**Magnetic Flux.**—(1) The streamings that issue from and return to the poles of a magnet. (2) The total number of lines of magnetic force in any magnetic field. (3) The magnetic flow that passes through any magnetic circuit.

**Magnetic Flux-Density.**—The quantity of magnetic flux in any part of a magnetic circuit per-unit-of-area of normal cross-section.

**Magnetic Flux-Intensity.**—The density of magnetic flux.

**Magnetic Flux-Paths.**—Paths taken by magnetic flux in any magnetic circuit.

**Magnetic Force.**—The force which causes the attractions and repulsions of magnetic poles.

**Magnetic Friction.**—A term sometimes used for magnetic hysteresis.

**Magnetic Fringe at Edge of Dynamo Pole-Pieces.**—The lateral dispersion, or diffusion of magnetic flux through the air space which produces an apparent fringe of magnetic flux in the air surrounding the poles.

**Magnetic Gearing.**—A form of friction gearing employing magnetic adhesion.

**Magnetic Generator.**—A magneto-electric generator.

**Magnetic Helix.**—A magnetizing coil.

**Magnetic Hysteresis.**—(1) Apparent molecular friction due to magnetic change of stress. (2) A lagging of magnetization behind the magnetic force producing it. (3) That quality of a magnetic substance

in virtue of which energy is absorbed on the reversal of its magnetization.

**Magnetic Image.**—The analogue in magnetism of an electric image in electrostatics.

**Magnetic Impermeability.**—A term sometimes used for magnetic reluctivity.

**Magnetic Inclination.**—(1) The angular deviation from a horizontal position of a freely suspended magnetic needle. (2) Magnetic dip.

**Magnetic Induction.**—(1) In air, the density of magnetic force; in iron or other magnetic material the sum of the prime flux, or magnetic force, and the magnetic flux thereby produced in the iron. (2) Total magnetic flux-density. (3) The production of magnetism in a magnetizable substance on its being brought into magnetic flux.

**Magnetic Inertia.**—The inability of a magnetic core to instantly lose or acquire magnetism.

**Magnetic Intensity.**—(1) Magnetic flux-density. (2) The quantity of magnetic flux per-unit-of-area of normal cross-section. (3) Magnetic induction.

**Magnetic Joint.**—A joint effected between contiguous pieces of iron forming portions of a magnetic circuit.

**Magnetic Lag.**—(1) Magnetic viscosity manifested by the sluggishness with which a magnetizing force produces its magnetizing effects in a mass of iron. (2) The tendency of an iron core to resist, and, therefore, to retard its magnetization. (3) Hysteresis in iron.

**Magnetic Lag Motor.**—A form of motor whose torque depends on magnetic lag or hysteresis.

**Magnetic Latitude.**—(1) The meridional angular distance of a place north or south of the magnetic equator. (2) The latitudes deduced from the magnetic dip.

**Magnetic Leakage.**—(1) A useless dispersion of magnetic flux of a dynamo or motor by its failure to pass through the armature. (2) Any useless dispersion of magnetic flux by its failure to pass through a magneto-receptive device placed in the magnetic circuit.

**Magnetic Leakage Factor.**—The ratio of the total flux generated in a magnetic circuit to the quantity usefully passing through an armature or magneto-receptive device.

**Magnetic Lightning-Arrester.**—(1) An electro-magnetic blow-out lightning-arrester. (2) Any lightning-arrester employing an electro-magnet.

**Magnetic Limbs.**—(1) Magnetic cores. (2) Magnetic arms.

**Magnetic Limit.**—A term sometimes employed for the temperature at which a magnetic substance loses its magnetism on exposure to heat.

**Magnetic Line-Protector.**—An electro-magnetic device placed on a telegraphic or other line for the purpose of protecting its instruments from lightning discharges.

**Magnetic Lines of Force.**—(1) Lines of magnetic force. (2) Flux paths. (3) The lines along which a free magnetic pole would be urged.

**Magnetic Magazine.**—A term sometimes employed for a compound magnet. (Obsolete.)

**Magnetic Mass.**—The quantity of magnetism or imaginary magnetic matter resident on a polar surface.

**Magnetic Memory.**—(1) That deviation of a magnetic condition of a magnetic substance from the complete response to an impressed magnetic force which is a function of antecedent magnetic states. (2) A term proposed for magnetic retentivity. (3) The power possessed by a magnetic substance, in virtue of hysteresis, to retain in any magnetic state, the history of antecedent states.

**Magnetic Meridian.**—(1) The great circle which passes through a place and through the poles of a magnetic needle at that place, when in a position of rest under the free influence of the earth's magnetism. (2) The terrestrial great circle coinciding in plane with the direction of the earth's local magnetic force.

**Magnetic Moment.**—(1) The product of the strength of one of the poles of a magnet into the distance between them. (2) The sum of the two forces of the directive couple of a magnet multiplied by half the perpendicular distance between the directions of these forces. (3) The length of a magnet multiplied by the intensity of one of its poles.

**Magnetic Needle.**—(1) A magnetized steel needle, or thin straight strip or rod. (2) A straight bar of magnetized steel, supported at or above its centre of gravity, and free to move in a horizontal plane only, in a vertical plane only, or in both.

**Magnetic North.**—That point of the horizon which is indicated by the north-seeking pole of a magnet.

**Magnetic Observatory.**—An observatory in which observations are made of the



variations in the direction and intensity of the earth's magnetic field.

**Magnetic Oscillation.**—A magnetic vibration, or to-and-fro variation.

**Magnetic Output.**—The product of the magnetic flux produced by any source and its magneto-motive force.

**Magnetic Parallels.**—Lines connecting places on the earth's surface at right angles to the isogonal lines, or lines of equal declination or variation.

**Magnetic Permeability.**—(1) Conductivity for magnetic flux. (2) The ratio between the magnetic induction produced in a magnetic substance, and the magnetizing force producing such magnetic induction.

**Magnetic Permeance.**—Magnetic permeability.

**Magnetic Permeation.**—The passage of magnetic flux through any permeable substance.

**Magnetic Perturbations.**—Abnormal magnetic variations, or disturbances.

**Magnetic Phantom.**—A term sometimes employed for magnetic figures.

**Magnetic Points of Convergence.**—The magnetic paths of the earth around which the isogonic lines are drawn.

**Magnetic Polar-Area.**—The active area of the pole-pieces of a magnet.

**Magnetic Polar-Intensity.**—The intensity of the magnetic flux produced at the pole-pieces of a magnet.

**Magnetic Polarization.**—That condition of a magnetizable substance when it is subjected to polarization.

**Magnetic Polar-Surface.**—The magnetic polar area.

**Magnetic Polarity.**—Polarity acquired by a magnetizable substance when brought into magnetic flux.

**Magnetic Poles.**—Those parts of a magnetic source from or at which the flux emerges or enters.

**Magnetic Potential.**—(1) That property of any space by virtue of which magnetic work is done when a magnet pole is moved therein. (2) The amount of work required to bring up a unit north-seeking magnetic pole from an infinite distance to a given point in a magnetic field. (3) The line integral of magnetic force on a unit pole in coming from an infinite distance to the point considered.

**Magnetic Proof-Piece.**—A magnetized elliptical or square rod employed for ascertaining the distribution of magnetism

over a magnet by the force required to detach the same.

**Magnetic Proof-Plane.**—A small coil of wire placed in the circuit of a delicate galvanometer, and used for exploring a magnetic field.

**Magnetic Reactance.**—In an alternating-current circuit the reactance of a coil as distinguished from the reactance of a condenser.

**Magnetic Reluctance.**—The resistance offered by a medium to the passage through it of magnetic flux.

**Magnetic Remanence.**—The magnetic flux-density left in iron or other magnetic substance after the removal of a magnetizing force.

**Magnetic Repulsion.**—Mutual repulsion exerted between two similar magnet poles.

**Magnetic Resistance.**—A term formerly used for magnetic reluctance.

**Magnetic Resistivity.**—(1) Magnetic reluctance. (2) The reluctance of a medium referred to the reluctance offered between parallel faces of a unit cube. (3) The magnetic analogue of electric resistivity.

**Magnetic Retardation.**—A retardation in the magnetization or demagnetization of a substance due to magnetic lag.

**Magnetic Retentiveness.**—A name sometimes applied to magnetic retentivity.

**Magnetic Retentivity.**—(1) The resistance a body offers to change of magnetization. (2) Hysteretic retention of magnetism when the magnetizing force is changed or wholly withdrawn. (3) That quality of iron or other magnetic substance in virtue of which it retains its magnetic flux after the withdrawal of the magnetizing force. (4) Magnetic remanence.

**Magnetic Ringer.**—A magnetic call-bell.

**Magnetic Rotary-Polarization.**—(1) Rotary polarization of a beam of plane polarized light, produced by its passage through magnetic flux. (2) Magneto-optic rotation.

**Magnetic Safety Factor.**—The factor of safety of demagnetization.

**Magnetic Saturation.**—(1) The maximum magnetization which can be imparted to a magnetic substance. (2) The condition of iron, or other magnetic substance, when its intensity of magnetization is so great that it fails to be further magnetized by any magnetizing force, however great.

**Magnetic Screen.**—(1) A hollow box whose sides are made of thick iron placed



around a magnet or other body, so as to shield its interior from a magnetic field external to the box. (2) A magnetic shield.

**Magnetic Screening.**—Preventing magnetic induction from taking place by interposing either a thick iron plate, or a plate of good conducting material, between the body producing the magnetic field and the body to be magnetically screened.

**Magnetic Self-Induction.**—(1) Electro-magnetic self-induction. (2) The power possessed by a magnet of inducing an opposite polarity in its own particles. (3) Self-magnetizing power in a magnet.

**Magnetic Sense.**—A name sometimes applied to the assumed sense by means of which magnetic influences are claimed to be perceived.

**Magnetic Shade.**—A term sometimes used for a magnetic screen.

**Magnetic Shells.**—Sheets or layers consisting of magnetic particles in each of which all the north poles are situated in one of the flat surfaces of the layer, and all the south poles in the opposite surface.

**Magnetic Shield for Watches.**—A hollow case of iron in which a watch is permanently kept in order to partially shield it from the influence of external magnetic flux.

**Magnetic Shunt.**—An additional path of magnetic material provided in a magnetic circuit for the passage of magnetic flux.

**Magnetic Shunt-Circuit.**—An additional or branch circuit through which some of the flux is diverted from the main magnetic circuit.

**Magnetic Shunt-Transformer.**—(1) A transformer provided with a magnetic shunt of regulable value, for the purpose of regulation. (2) A transformer situated in a magnetic shunt.

**Magnetic-Siren Telephone-Call.**—A magnetophone employed as a telephone call.

**Magnetic Solenoid.**—A spiral coil of wire, which acts like a magnet when an electric current is sent through it.

**Magnetic Sounds.**—Faint clicks heard on the magnetization and demagnetization of a readily magnetizable substance.

**Magnetic Source.**—Anything capable of producing magnetic flux.

**Magnetic Spectrum.**—(1) A term sometimes employed in place of magnetic figures or a magnetic field. (2) The succession of bright and dark fluorescent bands produced upon a suitable screen in

a Crookes tube when the cathode rays are deflected by magnetic flux.

**Magnetic Spin.**—A term sometimes employed for magnetic field.

**Magnetic Spiral.**—A magnetizing spiral or helix.

**Magnetic Sticking of Armature.**—The magnetic adhesion of the armature to the magnet poles under the influence of hysteresis.

**Magnetic Storm.**—(1) Any unusually marked irregularity occurring in the distribution of the earth's magnetism resulting in a variation in the value of its magnetic elements. (2) A comparatively violent and widespread temporary perturbation of the earth's magnetic elements in some way associated with solar disturbances and electric earth currents.

**Magnetic Strain.**—The result of subjecting any medium to magnetic stress or magnetic flux.

**Magnetic Stream-Lines.**—(1) Magnetic flux-paths. (2) Lines of magnetic flux. (3) The curved paths along which a free magnetic pole would be urged in different parts of the field.

**Magnetic Stress.**—(1) The mechanical stress exerted by the attraction of magnetized bodies. (2) That property of flux which produces magnetic strain or magnetic phenomena in bodies subjected to its influence.

**Magnetic Susceptibility.**—(1) The ratio existing between the induced magnetization and the magnetizing force producing such magnetization. (2) The intensity of magnetism divided by the magnetic force.

**Magnetic Telephone.**—(1) A name sometimes given to an electro-magnetic telephone. (2) A magneto telephone.

**Magnetic Telephone-Transmitter or Receiver.**—A magneto-telephone-transmitter or receiver.

**Magnetic Theodolite.**—An apparatus for measuring the declination or variation of the magnetic needle at any place.

**Magnetic Tick.**—(1) A metallic click heard on the magnetization and demagnetization of a bar of iron or steel. (2) The Page effect.

**Magnetic Time-Constant.**—In an electric circuit or conductor, the ratio of the inductance to the resistance, usually expressed in henrys per ohm, or seconds.

**Magnetic Traction.**—(1) Tractive or supporting power exerted by a magnet. (2) Hauling or carrying effected magnetically.

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— *Journal of the American Medical Association*, 1997

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*Journal of Management Studies*, 19(1), 67-80.

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**Curves.**—Curves which represent the relation of intensity to the intensity

**Magnetization Cycle.**—1. A cycle

**Succession Cycle.**—1. A cycle of  
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netic states which terminate in the original state.

**Magnetize.**—To endow with the property of magnetism.

**Magnetized.**—Endowed with the property of magnetism.

**Magnetizee.**—A word proposed to designate a person who believes he is placed under the power of animal magnetism.

**Magnetizer.**—(1) One who, or that which, magnetizes. (2) A word proposed to designate a person who claims that he can place another under the power of his animal magnetism.

**Magnetizing.**—Endowing a body with magnetic qualities.

**Magnetizing Ampere-Turns.**—The ampere-turns of a magnetizing coil.

**Magnetizing Currents.**—Currents that are employed in producing magnetization.

**Magnetizing Flux.**—Flux which is intended to magnetize a body, or to keep it magnetized, as distinguished from magnetic flux which performs any other functions.

**Magnetizing Force.**—(1) The vector space-rate of descent of magnetic potential. (2) The prime flux-density impressed upon a body, and which may induce magnetism in the same. (3) The force at any point with which a unit magnetic pole would be acted on. (4) The impressed flux-density of a field as distinguished from the total flux-density.

**Magnetizing Helix.**—A magnetizing spiral or solenoid.

**Magnetizing Spiral.**—A magnetizing helix or solenoid.

**Magnetizing Turn.**—A single turn in a magnetizing coil.

**Magneto.**—(1) A magneto-generator. (2) A small magneto-electric dynamo machine.

**Magneto-Alternator.**—An alternator whose field flux is produced by permanent magnets.

**Magneto-Blasting Machine.**—A magneto-electric machine employed for generating the currents used in electric blasting.

**Magneto Call-Bell.**—A call-bell operated by a magneto-electric machine.

**Magneto-Chemical Cell.**—A cell, the voltage couple of which consists of two magnetized steel bars, whose north and south poles are respectively immersed in a solution of oxalic acid.

**Magnetod.**—A name employed by Reich-

enbach for the assumed force or principle of animal magnetism.

**Magneto-Dynamic Force.**—The force exerted between magnets, or between magnets and electric currents.

**Magneto-Dynamics.**—That branch of dynamics which treats of the influence of magnet poles on one another.

**Magneto-Electric Alternating Machine.**—A magneto-alternator.

**Magneto-Electric Bell.**—An electric bell whose actuating current is obtained from a magneto-electric machine.

**Magneto-Electric Brake.**—(1) A device for checking the swing of a galvanometer consisting of means for sending slight inverse currents through the coils of the galvanometer. (2) An electro-magnetic brake.

**Magneto-Electric Call-Bell.**—A call bell operated by a magneto-electric machine.

**Magneto-Electric Dynamo.**—A dynamo-electric machine whose field magnets are formed of permanent magnets.

**Magneto-Electric Faradic Apparatus.**—A small magneto-electric machine employed in electro-therapeutics for producing faradic currents.

**Magneto-Electric Force.**—A theoretically-assumed mechanical force exerted between a magnetic current and an electric field, corresponding to the electromagnetic force known to be exerted between an electric current and a magnetic field.

**Magneto-Electric Generator.**—A magneto-generator.

**Magneto-Electric Induction.**—A variety of electro-dynamic induction in which electric currents are produced by the motion of permanent magnets past conductors, or of conductors past permanent magnets.

**Magneto-Electric Key.**—A telegraphic key so arranged that a coil of wire on an armature connected with a key lever, through the movements of the key towards and from the poles of a permanent magnet, produces currents that are sent into the line.

**Magneto-Electric Machine.**—A magneto-generator.

**Magneto-Electrical Medical Apparatus.**—A small magneto-alternator employed in medical electricity for the production of alternating or pulsating currents.

**Magneto-Electric Multiplier.**—An early form of induction coil employed by Page.

**Magneto-Electricity.**—(1) Electricity produced by the motion of magnets past conductors or of conductors past magnets. (2) Electricity produced by magneto-electric induction.

**Magneto-Generator.**—A dynamo-electric machine whose field flux is obtained from permanent magnets.

**Magnetogram.**—Any automatic record obtained by means of a magnetic instrument.

**Magnetograph.**—A permanent record obtained by the action of a self-recording magnetometer.

**Magneto-Induction Key.**—A magneto-electric telegraph transmitter so arranged that the movements of a key produce the electric currents that are sent into the line.

**Magneto-Inductor.**—An inductor consisting of a permanent magnet as distinguished from an inductor consisting of an electro-magnet.

**Magneto-Inductive Capacity.**—A term sometimes employed for magnetic permeability.

**Magneto Instrument.**—(1) A name formerly applied to a magneto machine. (2) In telegraphy, a name sometimes employed for a machine operating or operated by magnetically-induced currents.

**Magnetology.**—(1) A name sometimes applied to the science of magnetism. (Not in general use.) (2) That branch of science which treats of magnetism. (Very seldom used.)

**Magnetometer.**—(1) An apparatus for the measurement of magnetic force. (2) Any apparatus for measuring the elements of the earth's magnetic force.

**Magnetometric.**—Of or pertaining to a magnetometer.

**Magnetometry.**—That branch of science which treats of the measurement of the strength of magnetic fields.

**Magneto-Motive.**—Producing magnetic effects.

**Magneto-Motive Force.**—(1) The force which produces magnetic flux. (2) The force that moves or tends to move magnetic flux.

**Magneto-Motive Intensity.**—A term sometimes used for the slope of magneto-motive force.

**Magneto-Motor.**—(1) A term formerly applied to a voltaic battery coupled in parallel. (2) A motor whose field is produced by permanent magnets.

**Magneto-Optic Rotation.**—A rotation of

the plane of polarization of a beam of plane polarized light on its passage through a transparent medium, when placed in a strong magnetic field in the direction of the beam.

**Magnetophone.**—A species of magnetic siren with which sounds are produced in a telephone by the periodic currents produced in its coils by the rotation of a perforated metallic disc in a magnetic field.

**Magneto-Pointer.**—A dial of a printing telegraph.

**Magneto-Polar.**—Possessing magnetic polarity.

**Magneto-Receptive Device.** A device that is capable of being energized when placed in magnetic flux.

**Magnetoscope.**—Any apparatus for the detection of the presence of magnetism, but not for measuring it.

**Magneto-Signals.**—Any signals operated by a magneto-electric machine.

**Magneto-Static Ammeter.**—An ammeter whose magnet is acted on by a uniform field of force with two coils, while attracted by two systems of powerful permanent magnets.

**Magneto-Static Current-Meter.**—A magneto-static ammeter.

**Magneto-Static Screening.**—Screening from the inductive effects of a stationary magnetic field.

**Magneto-Statics.**—The science which treats of magnetic forces at rest.

**Magneto-Tapper.**—(1) A term sometimes employed for a magneto-key. (2) A contact key which closes the circuit of a magneto.

**Magneto-Telephone Transmitter.**—A telephone transmitter formed of a powerful compound magnet provided with a coil of insulated wire supported in front of one of its poles, and an iron core forming the pole-piece of the magnet.

**Magneto-Therapy.**—Alleged electrotherapeutic effects produced by the application of magnets to the human body.

**Magnet Wire.**—Insulated wire suitable for winding magnets and usually cotton-covered.

**Maggie Cable.**—A name given to a form of telephone cable in which the wires or conductors are arranged in double pairs.

**Main Battery.**—The battery employed in telegraphic systems for sending the signals over the main line, as distinguished from a battery employed for any other work.

**Main-Battery Circuit.**—(1) A term sometimes used for line circuit. (2) The cir-



cuit of the main battery in any conducting system.

**Main-Circuit Fuse.**—A safety fuse provided for the protection of the main circuit.

**Main-Circuit Switch.**—A switch inserted in a main circuit.

**Main Cut-Out.**—Any cut-out placed in the circuit of a main.

**Main Feeder.**—(1) The feeder to which the standard pressure-indicator is connected, and whose pressure controls the pressure at the ends of all the other feeders. (2) A standard feeder. (3) A principal feeder supplying a group of sub-feeders.

**Main Fuse.**—A main-circuit fuse.

**Main-Line-Circuit Switch.**—A main switch.

**Main-Line Cut-Out.**—A main cut-out.

**Main-Line Relay.**—A relay suitable for use in connection with a main telegraphic line.

**Main-Line Sounder.**—A sounder suitable for use in connection with a main telegraphic line.

**Main Switch.**—(1) A switch connected with the electric mains. (2) A principal switch controlling a group of subsidiary switches. (3) A main-line-circuit switch.

**Main Telegraphic-Circuit.**—The principal or line telegraphic circuit.

**Main Telegraphic-Current.**—The current employed on a main telegraphic line or circuit.

**Main Terminals of Machine.**—(1) The principal terminals of a machine. (2) The terminals connected with the external circuit of a machine.

**Main-to-Dynamo Bonding.**—A phrase employed for a method of bonding the rails in an electric car system, in which the bonding is between a positive water main, or buried metallic system, and the negative terminal of the dynamo.

**Main-to-Track Bonding.**—A phrase employed for a method of bonding of the rails in an electric car system in which the bonding is between a positive water main and a negative track.

**Main-Trunk Telephone-Line.**—(1) A main telephone line connecting two cities and usually erected with considerable care, as to conducting power, insulation, and freedom from electrical disturbance, so as to serve as a general link of communication either for communication between those cities, or for communication through those cities. (2) A term used in

contradistinction to a local telephone line connecting two stations.

**Main Tubes.**—The tubes in an underground system, provided for the mains.

**Main Voltmeter.**—(1) A voltmeter in a central station connected with the mains. (2) A principal or standard voltmeter.

**Main Wire.**—(1) Wire used in or intended for electric mains. (2) Wire constituting part of an electric main. (3) The principal electric conductor in a distribution or conducting system.

**Mains.**—(1) In a parallel system of distribution the parallel conductors carrying the main current, and to which translating devices are connected. (2) In a system of parallel distribution, the principal conductors which extend from the risers, or service wires, along the corridors or passages along the floor to be lighted.

**Mains of Electric Railroads.**—The mains from which the driving current is supplied to the cars.

**Make.**—To complete or close a circuit.

**Make-and-Break.**—The operation of alternately completing and opening a circuit.

**Make-Induced Current.**—(1) The current produced by self-induction on the making or closing of a circuit. (2) The current produced by mutual induction in the secondary of an induction coil or transformer, on the making or completion of the circuit of the primary.

**Making Earth.**—In telegraphy, grounding.

**Making the Primary.**—Closing the circuit of the primary.

**Making-Up Batteries.**—Joining voltaic cells in series or in parallel.

**Manganin.**—A high-resistivity metal of very low resistivity temperature-coefficient.

**Mangin Projector.**—A special form of search-light projector.

**Mangin Reflector.**—A special form of dioptric reflector employed in connection with the Mangin projector, consisting of a circular glass reflector, silvered at the back, and whose inner and outer or front and back surfaces are both spherical.

**Manganin Resistance.**—A resistance made of manganin wires, strips, or sheets.

**Man-Hole Compartment of Conduit.**—A man-hole provided in a conduit for affording access to the same.

**Man-Hole of Conduit.**—An opening communicating from the surface of the road-

bed with an underground conduit, of sufficient size to admit a man.

**Manometer.**—An apparatus for measuring the tension or pressure of gases.

**Manometric.**—Of or pertaining to a manometer.

**Man-Power.**—A unit of power equal to the one-tenth of a horse-power, or about 75 watts.

**Manual Alarm.**—A fire alarm operated by hand-power.

**Manual Igniting Device.**—(1) A pendant electric gas-lighting burner. (2) An electric gas igniter operated by hand. (3) A manual mine exploder.

**Manual Repeater.**—A telegraphic repeater which is controlled or operated by hand, as distinguished from an automatic repeater.

**Manual Telegraphic Transmission.**—Transmission by hand, as distinguished from automatic or machine transmission.

**Manual Translation.**—The translation, especially in submarine telegraphy, of a message from one circuit to another, by an operator who transmits to the second circuit, direct from signals received on the first, without writing down or transcribing the messages.

**Marconi Rays.**—Electro-magnetic waves employed in the Marconi system of wireless telegraphy.

**Marconi Waves.**—Electromagnetic waves employed in the Marconi system of wireless telegraphy.

**Margin of Relay Adjustment.**—The range of alteration permissible in the adjustment of the armature of a relay without interfering with the working of the instrument.

**Marine Galvanometer.**—(1) A form of Thomson reflecting galvanometer, heavily encased in iron, devised for use on steamships where the motion of magnetized masses of iron would seriously disturb the reading of ordinary instruments. (2) Any form of galvanometer suitable for use on board ship.

**Marine Junction-Box.**—A water-tight junction box for effecting junctions between mains, or mains and branches, on board ship.

**Marine Lamp-Socket.**—A form of spring socket for flexibly supporting an incandescent lamp on board ship.

**Marine Search-Light or Lamp.**—An electric search-light suitable for use at sea.

**Marine Switch.**—A water-tight switch in

an incandescent lamp, fixture, or circuit, on board ship.

**Marine Voltmeter.**—A form of voltmeter suitable for use on a ship.

**Mariner's Compass.**—(1) A compass mounted in such a manner as to be serviceable on board ship. (2) A name often applied to an azimuth compass.

**Mark Buoy.**—In submarine cable work, a buoy moored to the bottom of the sea by a mushroom anchor, and placed to mark a certain position, as distinguished from a cable buoy which is moored to the end of a cable.

**Marked End of Magnet.**—A name formerly applied to the north-seeking pole of a magnet.

**Marked Pole of Magnet.**—A term sometimes applied to the north-seeking pole of a magnet.

**Markers.**—Colored flags or signal lights, usually green, displayed in systems of block railroad-signalling, in order to avoid accident from the train breaking in two.

**Marking Current.**—The current employed in automatic telegraphy to produce the dots and dashes of the Morse alphabet as distinguished from the spacing current or that employed to leave spaces between such characters.

**Marking Disc.**—In a Morse ink-writer, the rotating inking disc, which marks the signals.

**Mass.**—The quantity of matter contained in a body.

**Mass Attraction.**—The mutual attraction exerted between masses of matter.

**Mass Specific-Resistance.**—(1) Specific resistance referred to unit mass instead of unit volume. (2) The resistance taken between the ends of a cylindrical wire of definite length, usually one metre, containing a mass, usually a gramme. (3) The resistance of a metre-gramme.

**Massage.**—The treatment of the body by kneading, rubbing or friction, for the purpose of effecting changes in its general nutrition.

**Mass, Electric.**—A mathematical conception for quantities of electricity which are so distributed as to produce electrostatic forces in conformity with the laws of gravitational forces, and, therefore, corresponding to material masses.

**Mass Specific Resistance.**—(1) The resistance of a known mass of a material; namely, one gramme, in the form of a circular sectioned wire one metre in length. (2) The resistance of a foot-grain.

**Mast-Arm for Arc-Lamp.**—A movable arm or bracket provided at the top of a pole for the support of a lamp arranged for the ready lowering of the lamp for re-carboning.

**Mast Compass.**—A compass secured to the mast of a ship, at an elevation sufficient to considerably reduce the component of local attraction from the ship's magnetization.

**Master Clock.**—A central or controlling clock employed in a system of electric time distribution, from which time is transmitted to the secondary clocks in its circuit.

**Mate of Wire in Twisted Pair.**—(1) One of the wires of a twisted pair. (2) The conjugate member of a wire in a twisted pair.

**Matt.**—(1) A word employed in electroplating to designate the appearance presented by an electroplating of silver in which the deposit is interlaced and closely matted together. (2) A fused mass of impure copper employed as the raw material in electrolytic refinement.

**Matter.**—Anything which occupies space in three dimensions and prevents other matter from simultaneously occupying the same space.

**Matter, Electric.**—A term formerly applied to the matter which was believed to constitute the effluvia formerly assumed to pass off from an electrified body.

**Matteucci's Muscular Pile.**—A pile formed by arranging a series of muscles so that their exterior and interior surfaces are alternately connected.

**Matthiessen's Metre-Gramme-Standard.**—(1) A standard of resistivity or conductivity in metallic wires. (2) The resistance of a wire one metre in length, and of such a diameter as would cause the wire to weigh one gramme. (3) According to the American Institute of Electrical Engineers Committee, the standard established by Matthiessen for a metre-gramme of soft copper, 0.1417 international ohm at 68° C., or 0.1501 international ohm at 15° C.

**Matthiessen's Mile-Standard.**—A standard of resistance equal to the resistance of one mile of pure copper wire one-sixteenth of an inch in diameter, at 15.3° Cent. No longer used.

**Matthiessen's Unit of Resistance.**—Matthiessen's mile-standard

**Maturing of Call.**—In a system of telephony where a number of calls have been received at an exchange and recorded for

execution in order, the time at which any particular call is reached in its order.

**Maximum.**—(1) Possessing the greatest value. (2) In a continuous succession of values, a value greater than that which precedes or follows it.

**Maximum Activity of Motor.**—(1) The activity of a motor when working at its greatest possible rate, or the activity when the useful work done is equal to half the energy expended. (2) The full-load activity of a motor. (3) The maximum available activity of a motor.

**Maximum Efficiency of Transformer.**—The highest efficiency obtainable from a transformer.

**Maximum Horizontal Intensity of Light.**—The greatest intensity of light emitted by a source in a horizontal direction.

**Maximum Magnetization.**—A term sometimes used for magnetic saturation.

**Maximum Negative-Elongation.**—The position of a vibrating body when it is at the extremity of its path on the negative side.

**Maximum Positive-Elongation.**—The position of a vibrating body when it is at the extremity of its path on the positive side.

**Maximum Starting-Current of Motor.**—The highest value the starting current of a motor attains.

**Maximum Traction Truck.**—A form of double-car-truck.

**Maxwell's Electro-Magnetic Theory of Light.**—(1) A hypothesis for the cause of light based on the relations existing between the phenomena of light and those of electro-magnetism. (2) A hypothesis that regards light as a purely electro-magnetic phenomenon.

**McIntire's Parallel-Sleeve-Telegraphic Joint.**—A joint for telegraphic or other wires, in which the ends to be joined are slipped into sleeves or parallel tubes, which are afterwards filled with solder.

**Mean.**—(1) Average. (2) A quantity having an intermediate value between others.

**Mean Annual Station-Current.**—The average current delivered by a station throughout the year.

**Mean Current.**—(1) The time average of a current strength. (2) In an alternating-current circuit, the time average of a current strength without regard to sign or direction.

**Mean Electromotive Force.**—(1) The average electromotive force. (2) In an



alternating-current circuit, the time average of the E. M. F. without regard to sign or direction.

**Mean Horizontal Intensity of Light.**—The average intensity of light in a horizontal plane containing the source.

**Mean Illumination.**—The average illumination.

**Mean Load-Current.**—The average load-current.

**Mean Spherical Candle-Power.**—(1) An average candle-power numerically equal to the total quantity of light emitted by a point source divided by 12 566. (2) The average candle-power of a source taken at all points of the surface of a sphere.

**Mean Spherical Intensity of Light.**—The mean spherical candle-power.

**Mean Quadratic Current.**—A term proposed for the effective strength of an alternating current.

**Mean Thermal Capacity for Heat.**—The average capacity for heat.

**Measurement of Resistance.**—The determination of the value of an electric resistance by any suitable means.

**Measurements, Electric.**—Determinations of the values of the electromotive force, resistance, current, capacity, energy, etc., in any electric circuit or instrument.

**Measuring Current.**—(1) The current by which an electrical measurement is made. (2) A testing current.

**Mechanical Air Pump.**—A mechanical device for exhausting or removing the air from any vessel.

**Mechanical Characteristic of Motor.**—A term sometimes employed for the curve of the torque and speed of a motor as coordinates.

**Mechanical Circuit-Closer.**—(1) Any circuit-closer not operated electrically. (2) An automatic circuit-closer not operated electrically.

**Mechanical Closer.**—A mechanical circuit-closer.

**Mechanical Cut-Out.**—(1) Any cut-out not operated electrically. (2) An automatic cut-out not operated electrically.

**Mechanical Depolarizer of Voltaic Cell.**—A method for removing the gas collected on the negative plate of a voltaic cell by the mechanical agitation of the liquid.

**Mechanical Equivalent of Heat.**—The amount of mechanical energy converted into heat that would be required to raise the temperature of a unit mass of water

one degree of the thermometric scale. (2) The quantity of energy mechanically equivalent to one heat unit.

**Mechanical Equivalent of Light.**—The quantity of energy contained in one unit of light.

**Mechanical Frictions of Dynamo.**—The journal, brush and air frictions of a dynamo.

**Mechanical Magnet Lightning-Arrester.**—A mechanical device operated by an electro-magnet for the extinguishment of the arc established by a lightning flash.

**Mechanical Mine.**—A submarine mine that is fired when struck by a passing ship through the action of some contrivance contained within the torpedo itself, and having no connection whatever with the shore.

**Mechanical Recording Meter.**—A mechanically operated recording meter.

**Mechanical Seal.**—A mechanically made seal of the chamber of an incandescent lamp.

**Mechanical Telegraph.**—Any form of telegraphy by which communication is established by mechanical means.

**Mechanical Telegraphic Interrupter.**—A form of mechanical telegraphic sounder for learners, where no battery is required.

**Mechanical Telephone.**—A wire or string telephone, operated by longitudinal vibrations transmitted through a wire or string.

**Mechanical Throwback-Indicator.**—An annunciator drop provided with a drop that is mechanically replaced.

**Mechanical Torpedo.**—A torpedo that is exploded by percussion against any obstacle.

**Mechanical Vibrator.**—(1) A mechanically operated contact-breaker. (2) A mechanical means for obtaining the ejection of the ink from the siphon in a siphon recorder.

**Mechanical Work.**—(1) The product of a force by the distance through which the force acts. (2) The expenditure of energy required for any change in the configuration of a material system.

**Medical Battery.**—A medical induction coil.

**Medical Electrician.**—An electro-therapist.

**Medical Induction-Coil.**—An induction coil used for medical purposes.

**Medical Magneto-Electric Apparatus.**



A term applied to small magneto-electric machines employed in electro-therapeutics for the production of uncommuted or faradic currents.

**Meg or Mega.**—A prefix for one million times.

**Mega-Dyne.**—One million dynes.

**Mega-Joule.**—One million joules.

**Mega-Lines.**—One million lines.

**Megalascope, Electric.**—An apparatus for the medical exploration of the cavities of the body.

**Mega-Volt.**—One million volts.

**Mega-Weber.**—One million webers.

**Mogerg.**—One million ergs.

**Megohm.**—One million ohms.

**Megohm Box.**—A resistance box containing a resistance or resistances equal to a megohm.

**Megohm Galvanometer.**—A galvanometer which gives unit deflection through a resistance of one megohm in circuit with one volt.

**Megohm Mile.**—A unit of linear insulation resistance equal in value to the product of a megohm by a mile, and such as is possessed by a mile of wire, the insulation of which is one megohm.

**Melting Points of Metals.**—Temperatures at which metals fuse.

**Membrane Diffusion.**—Osmose.

**Membrane Telephone-Receiver.**—An early form of telephone receiver whose diaphragm was formed of a sheet of gold-beater's skin.

**Mercurial Air-Pump.**—(1) A device for obtaining a high vacuum by the use of mercury. (2) The Geissler or Sprengel mercury pumps.

**Mercurial Connection.**—A form of readily adjustable connection obtained by providing the poles of one piece of apparatus with cups or cavities filled with mercury, in which the terminals of another piece of apparatus are dipped, in order readily to place them in circuit with each other.

**Mercurial Contact.**—An electric contact effected through the medium of mercury.

**Mercurial Phosphorescence.**—A term formerly employed for the light produced by the motion of a column of mercury in an exhausted tube.

**Mercurial Temperature Alarm.**—An instrument for automatically telegraphing an alarm by means of a mercurial contact, on a pre-determined change of temperature.

**Mercurial Thermostat.**—A thermostat operating by the expansion of a mercury column.

**Mercury Break.**—A form of circuit breaker operated by the removal of a conductor from a mercurial surface.

**Mercurial Commutation.**—A change in the direction of a current obtained by means of a mercurial connection.

**Mercury Cup.**—A cup partly filled with mercury employed as a mercurial contact.

**Mercury Gauge.**—A vacuum or pressure gauge whose indications are dependent on the height of a mercury column.

**Mercury Piezometer.**—An instrument employed in cable work for measuring the depth of the ocean, by recording the pressure at the lowest point reached by the sounding lead, and used as a check upon the length of sounding line.

**Mercury Switchboard.**—A switchboard in which connections are effected by mercurial contacts.

**Mercury Tube.**—(1) A sealed glass tube containing mercury arranged to emit fluorescent light when agitated. (2) A resistance formed of a thread of mercury contained in a tube.

**Meridional.**—Of or pertaining to a meridian.

**Mesh Grouping of Polyphase Circuit.**—A triangular or delta-connection of three-phase coils as distinguished from a star connection.

**Message Wire.**—A line or wire employed in block systems for railroads extending along the road and used for local telegraphic business.

**Messenger Call-Box.**—A district call-box.

**Messenger Rope.**—(1) In cable-work a rope drive for operating a drum or winch at a distance. (2) A rope supporting guide sheaves.

**Messenger Strand.**—A strand in a messenger wire.

**Messenger Wire of Aerial Cable.**—The supporting wire or rope from which the cable clips employed in the suspension of an aerial cable are supported.

**Metal-Cased Blake Transmitter.**—A form of telephone transmitter provided with a metallic covering.

**Metallic.**—Of or pertaining to a metal.

**Metallic Arc.**—An arc formed between metallic electrodes.

**Metallic Circuit.**—A circuit which is metallic throughout, in contradistinction to an earth-return circuit.

**Metallic-Circuit Plug.**—In a telephone switchboard, a plug which makes contact both at its tip and at its sleeve, so as to close a double or metallic circuit connected therewith by a twin cord.

**Metallic Coating.**—An electrolytically deposited coating of metal.

**Metallic Connection.**—Connection by means of a metallic conductor.

**Metallic Conducting Joint.**—A joint in a conductor in which a continuity of conducting power is secured.

**Metallic Conduction.**—The conduction of electricity through a metal, in contradistinction to its conduction through an electrolyte.

**Metallic Conductor.**—A conductor formed of a metal.

**Metallic Contact.**—(1) A contact of a metallic conductor obtained by bringing it into firm connection with another metallic conductor. (2) Contact between metal and metal.

**Metallic Contact of Cable.**—A complete start between the copper conductor of a submarine cable and its metallic sheath.

**Metallic Cross.**—A fault due to the actual contact between two or more wires or conductors, so that the current from one line passes to another.

**Metallic Electric Conduction.**—(1) A conduction of electric energy by means of metallic substances. (2) Metallic conduction.

**Metallic Electrodes.**—Variously shaped pieces of metal employed for electrotherapeutic electrodes.

**Metallic Electrolysis.**—A form of cataphoretic medication in which a metallic electrode, connected to the positive pole of a continuous-current source, is brought into contact with the part to be treated, while the negative pole is applied to some other part of the body, and the metallic salt formed by electrolysis at the anode is cataphoretically driven into the tissues beneath the electrode.

**Metallic Filament.**—A metallic wire employed as a filament of an incandescent lamp.

**Metallic Reluctivity.**—(1) The reluctivity of a metallic substance. (2) In a magnetic substance the reluctivity of the substance as considered independently of the reluctivity of the ether in its mass.

**Metallic Resistance.**—A term sometimes applied to the resistance of wires or conductors, in contradistinction to the resistance of insulating materials.

**Metallic Resistivity.**—The resistivity of a metallic substance.

**Metallic Solution.**—A solution of a metallic salt.

**Metallization.**—Rendering a non-conducting surface electrically conducting by covering it with a metallic coating so as to enable it to be readily electro-plated.

**Metallizing.**—Subjecting to the process of metallization.

**Metallo-Chromes.**—(1) A name sometimes given to Nobili's rings. (2) Prismatic colors which appear when a salt of lead, such as an oxide, is electrolyzed under certain circumstances.

**Metallurgy.**—That branch of science which treats of the reduction or treatment of metallic ores or metals.

**Metamerism.**—(1) A variety of isomerism. (2) The quality possessed by some chemical substances, differing in their properties, although similar in their quantitative composition, owing to a difference of molecular construction or arrangement of atoms in the molecule. (3) A term used in distinction to polymerism.

**Meteorites.**—Fragmentary solids that when attracted to the earth become incandescent on their passage through its atmosphere.

**Meteorograph, Electric.**—An apparatus for automatically registering by electricity various meteorological values such as the indications of a barometer or thermometer, the direction and velocity of the wind, the value of the rain-fall, etc.

**Meteorology.**—That branch of physics which treats of the phenomena of the atmosphere.

**Meteorology, Electric.**—That branch of physics which treats of the electric phenomena of the atmosphere.

**Meter, Electric.**—Any apparatus for measuring commercially the quantity of electricity that passes in a given time through a consumption circuit.

**Meter-Motor.**—(1) A small motor employed in operating an electric meter. (2) A meter comprising a small motor.

**Meter Sealing Tool.**—A tool for stamping a leaden seal which prevents the undisturbed opening of a meter by an unauthorized person.

**Method of Recoil.**—A method of measuring a discharge through a ballistic galvanometer by reversing the direction of its swing.

**Method of Slow Discharge.**—An insu-

lation test for a telegraphic line, based on the rate at which a charge leaks out when the conductor is left insulated.

**Methven Carburetter.**—A device employed in connection with a Methven screen, consisting of troughs of fine wire gauze filled with gasoline, so that the gas passing through becomes charged with the vapor.

**Methven's Screen.**—A vertical rectangular metallic screen used in connection with a standard Argand burner as a photometric standard.

**Metre.**—A unit of length equal, approximately, to one ten-millionth part of a quadrant of a meridian of the earth taken through Paris; or, approximately, to 39.37 inches.

**Metro-Bridge.**—A slide form of Wheatstone's bridge in which the slide wire is one metre in length.

**Metre-Candle.**—(1) The illumination produced by a standard candle at the distance of one metre. (2) A unit of illumination.

**Metre-Gramme.**—(1) A unit of resistance equal to that of the resistance of a wire one metre in length weighing one gramme. (2) A standard of comparison of resistivity or conductivity. (3) Matthiessen's metre-gramme standard of copper wire, which for soft copper wire, according to the committee of the American Institute of Electrical Engineers, is 0.1501 International ohm at 15° C.

**Metre-Millimetre.**—A resistance standard, consisting of a length of wire or other conductor, one metre long and having a diameter of one millimetre.

**Mettric Factors.**—The factors employed for the conversion of the metric system units into those of other systems.

**Metric Horse-Power.**—A unit of power in which the rate-of-doing-work is equal to 75 kilogramme-metres per second.

**Metric System of Weights and Measures.**—A system of weights and measures based on the metre and the gramme.

**Mho.**—(1) The practical unit of conductance. (2) Such a conductance as is equal to the reciprocal of one ohm. (3) A unit of electric conductance of the value of  $10^9$  absolute units.

**Mho-Box.**—A conductance box, or box containing adjustable conductance, graduated in mhos.

**Mhometer.**—An instrument for measuring the value of a conductance in mhos.

**Mica.**—(1) A refractory, mineral substance employed as an insulator. (2) A double

silicate of alumina or magnesia and potash or soda.

**Micanite.**—A variety of insulating material made from and built up of small mica sheets bound together by some insulating cement.

**Micro.**—A prefix for the one-millionth.

**Micro-Ampere.**—The millionth of an ampere.

**Micro-Coulomb.**—The millionth of a coulomb.

**Micro-Parad.**—The millionth of a farad.

**Micro-Gilb.**—A contraction for micro-gilbert.

**Micro-Gilbert.**—The millionth of a gilbert.

**Micro Glow-Lamp.**—A miniature incandescent lamp.

**Micro-Graphophone.**—A modification of the phonograph, in which a number of separate non-metallic diaphragms are caused to act on a single diaphragm, for the purpose of obtaining stronger vibrations of the same.

**Micrometer Caliper.**—A micrometer wire gauge.

**Micrometer Eye-Piece.**—An eye-piece of a telescope, microscope or other optical apparatus provided with a micrometer.

**Micrometer Microscope.**—A microscope provided with a micrometer eyepiece.

**Micrometer Wire-Gauge.**—A sensitive form of wire gauge, usually constructed with a fine thread-screw, having a graduated head for close measurements of wire diameters.

**Micron.**—A unit of length equal to the millionth part of a meter.

**Microhm.**—The millionth of an ohm.

**Microphone.**—A form of contact telephone-transmitter employed in connection with a telephone for rendering faint or distant sounds distinctly audible.

**Microphone Induction-Coil.**—An induction coil employed in connection with a microphonic telephone transmitter.

**Microphone Relay.**—A device for automatically repeating a telephonic message over another wire.

**Microphonic.**—Of or pertaining to the microphone.

**Microphonic Contact.**—A loose contact capable of being employed for a telephone transmitter.

**Microscope.**—An optical instrument for the examination of objects too minute to be seen by the unaided eye.

**Microscopic.**—(1) Of or pertaining to the

microscope. (2) Of very minute dimensions.

**Microscopy.**—The art of microscopic examination.

**Micro-Seismograph.**—An electric apparatus for graphically recording the direction and intensity of faint earthquake shocks or earth tremors.

**Micro-Tasimeter.**—An apparatus invented by Edison for measuring minute differences of temperature, or of moisture, by the resulting differences of pressure upon a carbon button.

**Micro-Telephone.**—(1) A convenient form of writing table-set telephone used by some exchange operators in quiet exchanges, or in busy exchanges, at night. (2) A form of combined transmitter and receiver. (3) A small semi-portable telephone set.

**Micro-Volt.**—The one-millionth of a volt.

**Migration of Ions.**—A term employed to express the movement of the ions in an electrolyte undergoing electrolysis.

**Migration Values of Ions.**—The velocities of the ions.

**Mil.**—A unit of length used in measuring the diameter of wires equal to the one-thousandth of an inch.

**Millammeter.**—A milli-ammeter.

**Mild Steel.**—A term employed for soft steel.

**Mil-Foot.**—(1) A resistance standard consisting of a foot of wire, or other conducting material, one mil in diameter. (2) A standard of comparison of resistivity or conductivity of wires.

**Milli.**—A prefix for the one-thousandth part.

**Milli-Ammeter.**—A milli-ampere meter.

**Milli-Ampere.**—The thousandth of an ampere.

**Milli-Ampere Meter.**—An ampere meter graduated to read in milli-amperes.

**Milli-Calorie.**—(1) The thousandth of a calorie. (2) The small calorie.

**Milli-Oersted.**—The thousandth of an oersted.

**Milli-Volt.**—The thousandth of a volt.

**Mimosa Sensitiva.**—A sensitive plant whose leaves fold or shut up, either when touched, or when traversed by electric currents.

**Mine Explorer, Electric.**—A small magneto-electric generator employed in the direct firing of blasts.

**Miniature Incandescent Lamp.**—A very small incandescent lamp, suitable for

decorative, microscopic, dental or surgical purposes.

**Mining, Electric.**—The application of electricity to mining.

**Mining Locomotive, Electric.**—An electric locomotive employed in mining operations.

**Minotto's Voltaic Cell.**—A form of Daniells' cell employing a flat copper plate at the bottom of the cell beneath a mass of copper sulphate crystals, the cell being then filled with wet sand, or wet sawdust, on which rests the zinc plate.

**Minus Charge.**—A negative charge.

**Miophone.**—An apparatus, based on the use of the microphone, employed for the medical examination of the muscles.

**Mirror Galvanometer.**—A galvanometer whose readings are obtained by the movements of a spot of light reflected from a mirror attached to the needle or its suspension system.

**Mirror Magnetometer.**—A magnetometer whose needle or suspension system is provided with a mirror.

**Mirror Receiver in Cable Telegraphy.**—In cable telegraphy, a mirror galvanometer employed as a receiver.

**Mirror Receiving-Instrument.**—(1) A receiving signalling instrument employed in submarine telegraphy, whose needle and suspension system is provided with a mirror. (2) A mirror galvanometer modified for use in telegraphing.

**Mirror Speaking-Instrument.**—A mirror receiving-instrument.

**Mixed Charge Test for Capacity.**—A test employed for determining the capacity of a submarine cable, in which an unknown capacity is charged to one potential, a known capacity is charged to an opposite potential, and the two charges are then mixed with the object of neutralization.

**Mixed Circuit.**—(1) In telephony, a circuit partly metallic and partly earth-circuited. (2) A term sometimes applied to the combination of a series and a multiple circuit.

**Mixed-Circuit Board.**—(1) A telephone switchboard arranged for the reception and inter-connection of metallic circuits and ground-return circuits. (2) A mixed-circuit switchboard.

**Mixed-Circuit Switchboard.**—A telephone switchboard connected with mixed circuits or circuits of which some are metallic and others are provided with ground return.

**Mixed Distribution.**—(1) A distribution



of electric energy which combines both series and parallel distribution. (2) Series-parallel or parallel-series distribution.

**Mixing Key.**—The key employed in simultaneously charging a cable and a condenser for producing the mixed charge employed in the mixed-charge test for capacity.

**Mixture Photometer.**—A photometer combining the principles of the compensation and the polarization photometer.

**Moderate-Speed Generator.**—A generator designed to be run at a moderate speed, as distinguished from a slow-speed generator.

**Moderate-Speed Motor.**—A motor designed to work at a moderate speed, as distinguished from a slow-speed motor.

**Modulus of Elasticity.**—(1) The ratio of the simple stress required to produce a small elongation or compression in a rod of unit area of normal cross-section, to the proportionate change of length produced. (2) Young's modulus.

**Moist Electrode.**—A therapeutic electrode moistened with water or some other liquid.

**Moist Voltaic Cell.**—A form of the so-called dry voltaic cell.

**Moisture-Proof Insulation.**—(1) Waterproof insulation. (2) A type of insulation which is not strictly water-proof, but which is capable of being immersed for a short time without suffering serious loss of insulation.

**Molar Attraction.**—(1) Mass attraction, as distinguished from molecular attraction or cohesion. (2) Gravitation.

**Molar Vibration of Telephone Diaphragm.**—The mass vibration of a telephone diaphragm, as distinguished from molecular vibration.

**Molecular.**—Of or pertaining to the molecules.

**Molecular Accommodation.**—A rearrangement of the molecules of a paramagnetic substance resulting, by constant repetition, in a decrease in the hysteretic friction in cyclic magnetization.

**Molecular Agitation.**—Rapid mechanical vibration given to a mass of iron for the purpose of reducing its magnetic hysteresis.

**Molecular Attraction.**—(1) The mutual attraction existing between neighboring molecules. (2) Cohesion or adhesion.

**Molecular Bombardment.**—(1) The collisions which occur between neighboring

molecules, and which are accentuated and accelerated by heat. (2) The forcible rectilinear projection from the negative electrode of the residual gaseous molecules in an exhausted vessel, on the heating of the same, or on the passage through it of an electric discharge.

**Molecular Chain.**—A polarized chain of molecules that is assumed by Gröthuss' hypothesis to exist in an electrolyte during its electrolytic decomposition, or in a voltaic cell on the closing of the circuit.

**Molecular Conductance.**—The conductance offered by a mass of an electrolyte equal to its molecular weight in grammes, when contained in an insulating vessel furnished with two opposite parallel conducting sides or faces, distant one centimetre apart.

**Molecular Conductivity of Electrolyte.**—(1) The conductance possessed by one gramme-molecule of an electrolyte when placed between electrodes one centimetre apart. (2) A term sometimes used for molecular conductance.

**Molecular Configuration.**—A term for the molecular groupings or the relative position of the molecules in a magnetizable substance.

**Molecular Currents.**—(1) A term sometimes employed for Amperian currents. (2) Atomic currents.

**Molecular Decomposition.**—Decomposition of a molecule.

**Molecular Dissociation.**—(1) Molecular decomposition. (2) The disruption of molecules into ions, or atoms.

**Molecular Encounter.**—A collision between two molecules of a gaseous substance that takes place during the to-and-fro movements they describe in accordance with the kinetic theory of gases.

**Molecular Heat.**—The number of calories of heat required to raise one gramme-molecule of a substance one degree Centigrade.

**Molecular Kinetics.**—The kinetics of the molecules.

**Molecular Magnetomotive Forces.**—(1) The magnetomotive forces inherently possessed by the molecules. (2) The aligned or structural-magnetomotive force as distinguished from the prime magnetomotive force.

**Molecular Magnetism.**—(1) The magnetism resulting from molecular magnetomotive forces. (2) The inherent magnetic flux in a molecule of a magnetic substance.

**Molecular Magnetization.**—The in-

herent magnetization possessed by the molecules.

**Molecular Magnets.**—The inherently magnetized molecules.

**Molecular Oscillations.**—To-and-fro movements or oscillations of the molecules.

**Molecular Range.**—The distance at which the molecules of matter continue to exert a sensible attraction on one another.

**Molecular Repulsion.**—The mutual repulsion existing between molecules arising from their kinetic energy.

**Molecular Resistance.**—(1) The resistance offered by a mass of an electrolyte equal to its molecular weight in grammes, when contained in an insulating vessel having two opposite parallel conducting faces distant one centimetre apart. (2) The resistance of one gramme-molecule of an electrolyte when brought between two electrodes one centimetre apart.

**Molecular Rigidity.**—The resistance offered by the molecules of a substance to rotation or displacement.

**Molecular Shadows.**—The comparatively dark spaces on those portions of the walls of a Crookes tube, which have been protected by molecular bombardment by suitably interposed screens.

**Molecular Streams.**—Rectilinearly directed streams of molecules, thrown off from the cathode of a high-vacuum tube, under the influence of heat or electric discharges.

**Muscular Theory of Muscle and Nerve Currents.**—A theory which regards every muscle or nerve fibre as formed of a number of series-connected electromotive molecules surrounded by a neutral conducting fluid.

**Molecular Transfer of Heat.**—The transfer of heat by means of molecular vibrations.

**Molecular Vibration of Telephone Diaphragm.**—The molecular vibration of a telephone diaphragm under the influence of the changes in the magnetization of the telephone magnet, as distinguished from its molar vibration.

**Monochromatic Photometry.**—(1) The photometry of monochromatic lights. (2) Photometry in which the spectra or the compositions of the lights to be compared are similar.

**Molecular Voltaic-Couple.**—A voltaic couple formed of the atoms or radicals of a molecule.

**Molecular Vortices.**—The vortices in the ether which, according to a particular

theory, are assumed to constitute the molecules, atoms or ultimate particles of matter.

**Molecule.**—(1) The smallest quantity of a compound substance that can exist as such. (2) A group of atoms whose chemical bonds or affinities are completely satisfied.

**Molten-Platinum Lamp.**—The *violle* or molten platinum standard.

**Molten-Platinum Standard of Light.**—(1) The *violle*. (2) The practical standard of white light adopted at the Electrical Congress of Paris, in 1884, and defined as the total quantity of light emitted by a square centimetre of molten platinum at the temperature of its solidification.

**Moment.**—(1) Torque. (2) The product of any quantity, directed with respect to an axis, and the perpendicular distance of its direction from that axis.

**Moment of a Couple.**—(1) The torque or effective power of a couple. (2) The intensity of one of the forces in a couple, multiplied by the perpendicular distance between the direction of the forces.

**Moment of a Magnet.**—The polar length of a magnet multiplied by the intensity of magnetism of one of its poles.

**Momentary Current.**—(1) A current that continues flowing but for a short time. (2) A current of brief duration.

**Momentum.**—(1) The product of the mass of a moving body by its velocity. (2) Quantity of motion in a system.

**Monad Atom.**—An atom whose valency or atomicity is one.

**Monivalent.**—(1) Possessing a valency or atomicity of one. (2) Univalent, or monovalent.

**Monochord.**—A sonometer.

**Monocular.**—An eye-piece or glass, provided for a single eye.

**Monophotal Arc-Light Regulator.**—A term sometimes employed for an electric arc-lamp in which the whole current passes through the arc-regulating mechanism, and which is usually operated singly in circuit with a dynamo.

**Monocycler.**—A monocyclic generator.

**Monocyclic.**—Of or pertaining to a monocycler, or to a monocyclic system.

**Monocyclic Alternator.**—A monocyclic generator.

**Monocyclic Armature.**—The armature of a monocyclic generator, provided with two sets of windings, one of which constitutes the main winding and corresponds to that of an ordinary uniphaser, while

the second is of smaller cross-section and fewer turns, and is connected to the centre of the main winding in diphasic relation to it.

**Monocyclic Circuit.**—The circuit of a monocyclic generator.

**Monocyclic Generator.**—A form of polyphase generator provided with a monocyclic armature.

**Monocyclic Motor.**—A form of induction motor suitable for use on monocyclic circuits.

**Monocyclic System.**—(1) A system of alternating-current distribution suitable for electric lighting with the additional capability of operating triphase induction motors. (2) A system for the distribution of alternating currents employing three wires, between two of which an ordinary uniphase pressure is maintained, while between either of them and the third, there is a diphasic pressure.

**Monogenic Charge.**—A name proposed for such a distribution of an electric charge in which the sign of the surface density is everywhere the same.

**Monophase Generator.**—An alternator producing uniphase or monophase currents.

**Monophase Motor.**—A uniphase motor.

**Mooring Chain.**—A chain employed for the mooring of a cable buoy.

**Mopped.**—Subjected to the action of a polishing mop.

**Morley Effect.**—A decrease in the value of the hysteresis in the iron of a dynamo armature at full load.

**Morse Alphabet.**—The Morse telegraphic alphabet.

**Morse Code.**—The Morse telegraphic alphabet.

**Morse Embosser.**—A Morse register.

**Morse Ink Writer.**—The name sometimes given to a Morse inker.

**Morse Inker.**—A form of telegraphic ink-writer printing signals in the Morse code.

**Morse Push.**—A term sometimes employed for a double-contact push.

**Morse Recorder.**—An apparatus for automatically recording the dots and dashes of the Morse telegraphic dispatch, on a fillet of paper drawn under an indenting or marking point on a striking lever connected with the armature of an electro-magnet, as distinguished from a Morse inker.

**Morse Register.**—A Morse recorder.

**Morse System of Telegraphy.**—A sys-

tem of telegraphy in which makes and breaks, occurring at intervals corresponding to the dots and dashes of the Morse alphabet, are received by an electromagnetic sounder, or other receiver.

**Morse Tapper.**—A form of telegraphic key provided with two contacts, one in front, and another on the back, so arranged that the depression of the key makes one contact and breaks the other.

**Morse Writer.**—A form of telegraphic Morse ink-writer.

**Morse Telegraphic Alphabet.**—Various groupings of dots and dashes or deflections of a needle to the right and left, employed for representing the letters of the alphabet or other signs.

**Morse Telegraphic Sounder.**—An electro-magnet, the movements of whose armature lever produce the audible sounds corresponding to the dots and dashes of the Morse code.

**Motional Electric Force.**—The electric force induced by the motion of magnetic flux, or of the medium supporting the flux.

**Motional Magnetic Flux.**—Magnetic flux produced by the motion of an electrostatic charge, or of electrostatic flux.

**Motorneer.**—A word proposed for motorman. (Not in general use.)

**Motor Armature.**—The armature of an electric motor.

**Motor Car, Electric.**—An electrically propelled car.

**Motor Circuit.**—A circuit containing an electric motor.

**Motor-Controlling Rheostat.**—A rheostat connected with a motor, and employed for starting the motor or for regulating its speed.

**Motor Out-Out.**—A cut-out provided in the circuit of a motor for the purpose of throwing it out of circuit.

**Motor-Dynamo.**—(1) An electrically driven motor, rigidly connected to the armature of a dynamo, and employed for transforming or changing the pressure of a direct-current circuit. (2) The combination, in a continuous-current generator of a motor and a dynamo, in separate structures, mechanically connected to form a single machine or structure.

**Motor-Electromotive Force.**—A term proposed for the counter-electromotive force of a motor.

**Motor, Electric.**—A device for transforming electric power into mechanical power.

**Motor-Generator.**—(1) A motor coupled



to a generator. (2) A motor-dynamo. (3) A form of secondary generator.

**Motorman.**—The man who operates a trolley car.

**Motor-Meter.**—(1) An electric meter whose operations depend on the movements of an electric motor. (2) A meter connected with the supply circuit of an electric motor.

**Motor Slip.**—The deviation of an induction motor from synchronous speed, or the proportional loss of synchronous speed due to load and losses of energy.

**Motor Standards.**—The supports for the bearing of an electric motor.

**Motor Starter.**—A term proposed for a motor starting-rheostat.

**Motor Starting-Box.**—A box containing a starting rheostat or controller.

**Motor Starting-Rheostat.**—An adjustable rheostat provided for preventing an abnormal rush of current through a shunt-wound motor, on the starting of the same.

**Motor Suspension.**—The suspension provided for the electric motors on a street-car truck.

**Motor Switch.**—A switch provided for the control of a motor.

**Motor Telegraph Printing System.**—A printing telegraph system in which two motors, one at the transmitting, and one at the receiving end of the line, are maintained in synchronous rotation.

**Motor Torque.**—The rotary effort developed by an electric motor.

**Motor-Transformer.**—(1) A transformer or secondary generator operated by a motor. (2) A motor-generator, dynamo-motor, or rotary-transformer. (3) A dynamo-electric machine having two armature windings, one to receive current as a motor, and the other to deliver current to a secondary circuit as a generator.

**Motor Truck.**—The truck of an electric car provided with supports for the suspension of an electric motor or motors.

**Motoring at Brushes.**—A term proposed for flashing at the brushes of a motor.

**Moulded Carbons.**—Artificial carbons made by moulding mixtures of carbonaceous substances under pressure.

**Moulded Filaments.**—The formation of an incandescent filament by moulding a suitable carbonaceous paste by hydraulic pressure.

**Moulded Mica.**—An insulating substance consisting of finely divided mica, made into a paste with some fused insulating

material, and moulded into the desired shape before cooling.

**Moulding Wiring.**—Electric conductors or wires that are held in place on the walls or ceiling of a room by means of suitably-shaped mouldings.

**Mouldings, Electric.**—Mouldings of dried non-conducting wood, provided with longitudinal grooves for the reception and support of insulated wires.

**Mounted Filament.**—The filament of an incandescent lamp placed on its support, ready for introduction into the lamp chamber.

**Mounting of Filament.**—Providing the filament and leading-in wires of an incandescent lamp with a suitable glass support ready for introduction into the chamber of an incandescent lamp, and its hermetical sealing therein.

**Mouse-Mill Dynamo.**—A form of dynamo-electric machine employed to drive a replenisher or influence machine.

**Mouse-Mill Machine.**—A form of induction machine employed as a replenisher or high-tension source.

**Mouth-Pieces.**—Circular openings into air chambers, placed over the diaphragms of telephones, phonographs, gramophones, or graphophones, to permit the ready application of the mouth in speaking, so as to set the diaphragm in vibration.

**Movable.**—Capable of being moved.

**Movable Secondary.**—The secondary of an induction coil, which, instead of being fixed, as in most coils, is movable.

**Multi-Cellular Electrostatic Voltmeter.**—An electrostatic voltmeter in which a series of fixed and movable plates are employed, instead of the single paired plates of the quadrant electrometer.

**Multi-Circuit Arc-Dynamo.**—A dynamo whose armature is provided with several circuits designed to avoid too high an electromotive force on any single circuit.

**Multi-Circuit Arc-Light Generator.**—(1) An arc-light generator designed to supply several series connected arc-circuits, as distinguished from a generator designed to supply a single circuit. (2) A multi-circuit arc dynamo.

**Multi-Coil Alternating-Current Armature-Winding.**—An alternator armature-winding containing on its surface more than one coil or group of conductors per pole of the field frame, as distinguished from a uni-coil winding.

**Multi-Conductor Cable.**—A cable provided with a plurality of conducting circuits.



**Multi-Duct Conduit.**—A conduit containing a plurality of ducts.

**Multi-Periodic Current.**—(1) A current composed of a number of associated component currents of different frequencies. (2) A complex-harmonic current.

**Multiphase.**—Containing more than a single phase.

**Multiphase Alternating Currents.**—A number of separate alternating currents which differ in phase by a fixed amount.

**Multiphase Alternator.**—An alternator capable of producing multiphase currents.

**Multiphase Apparatus.**—A general term for multiphase alternators, motors, or other receptive apparatus, suitable for use on multiphase circuits.

**Multiphase Circuits.**—The circuits employed in a system of multiphase distribution.

**Multiphase Dynamo.**—A multiphase alternator.

**Multiphase Generator.**—A multiphase alternator.

**Multiphase Induction Motor.**—An induction motor suitable for use in connection with multiphase currents, and operated by rotating magnetic fields.

**Multiphase Synchronous Motor.**—A synchronous alternating-current motor supplied with multiphase currents as distinguished from an asynchronous or induction multiphase motor.

**Multiphase System.**—A system for the distribution of energy by multiphase currents.

**Multiphaser.**—A multiphase alternator.

**Multiple-Arc Circuit.**—A term often used for multiple circuit.

**Multiple-Arc Connected Electro-Receptive Devices.**—Electro-receptive devices connected with the driving circuit in multiple arc.

**Multiple-Arc-Connected Sources.**—A battery of multiple-connected sources.

**Multiple-Arc-Connected Translating Devices.**—Multiple arc connected electro-receptive devices.

**Multiple-Arc Resistance Box.** A resistance box whose resistances are capable of being inter-connected in multiple arc.

**Multiple Armature Windings.**—(1) A term sometimes used for multiple-circuit armature windings. (2) A term sometimes used for multiple-wound armature windings.

**Multiple Cable.**—A cable containing

more than a single conducting wire or circuit.

**Multiple Cable-Core.**—A cable containing more than a single conducting wire or core.

**Multiple Call-Box.**—A call-box capable of automatically transmitting a number of different calls.

**Multiple Circuit.**—A circuit in which a number of separate sources or separate receptive devices, or both, have all their positive poles connected to a single positive lead or conductor, and all their negative poles connected to a single negative lead or conductor.

**Multiple - Circuit Multiple - Wound Armature.**—An armature providing a plurality of circuits between the brushes, and also a plurality of independent windings connected to symmetrically interspersed independent commutator bars.

**Multiple Circuit Winding of Armature.**—Such a winding as provides a multiplicity of circuits in parallel through an armature.

**Multiple Conduit.**—A conduit provided with a number of separate ducts.

**Multiple - Connected.**—Connected in multiple-arc.

**Multiple-Connected Battery.**—A battery whose separate cells are connected in multiple-arc.

**Multiple-Connected Electro - Receptive Devices.**—Multiple-arc-connected translating devices.

**Multiple-Arc-Connected Sources.**—A number of separate sources connected in multiple-arc, so as to act as a single source.

**Multiple Connection.**—Connection in parallel or in multiple-arc.

**Multiple-Contact Carbon Telephone Transmitter.** (1) A telephone transmitter provided with a number of separate contacts. (2) A dust telephone transmitter.

**Multiple Converter.**—A multiple transformer.

**Multiple Electric Gas-Lighting.**—A system of electric gas-lighting in which a number of gas jets are ignited by high electromotive force discharges obtained from a Ruhmkorff coil or static induction machine.

**Multiple Electrode Telephone.**—A telephone transmitter possessing a plurality of active contacts.

**Multiple Electrolysis.**—Electrolysis pro-

ducing or accompanied by secondary chemical reactions.

**Multiple-Harmonic Telegraph.**—A general term embracing the apparatus employed in multiple-harmonic telegraphy.

**Multiple-Harmonic Telegraphy.**—A system for the simultaneous transmission of a number of separate and distinct musical notes over a single wire, which separate notes are utilized for the simultaneous transmission of an equal number of independent telegraphic messages.

**Multiple Jacks.** The reduplicating jacks of a multiple telephone switchboard.

**Multiple Lightning Flash.**—Several lightning flashes apparently coming from the same cloud.

**Multiple-Pair Brush-Rockor.**—A term sometimes used for multiple-pair brush-yoke.

**Multiple-Pair Brush-Yoke.**—A device for holding a number of pairs of brushes on the commutator, so that they can all be simultaneously moved or rotated thereon.

**Multiple-Parallel Circuit.**—A term sometimes employed for a multiple of parallel circuits.

**Multiple Quadruplex.**—A system of repeating from more than one quadruplex circuit to a branch office, or repeating from one quadruplex circuit to another.

**Multiple Resonance.** The partial resonance of a primary conductor devoid of a definite period of oscillation, and, therefore, capable of performing all possible oscillations lying within wide limits.

**Multiple Rheostat.**—A form of rheostat whose resistances are capable of being thrown into a circuit in multiple, so that the carrying capacity increases as the resistance is decreased.

**Multiple Running.**—The operation of generators in parallel.

**Multiple-Series.**—A multiple connection of series groups.

**Multiple-Series Circuit.**—A circuit in which a number of separate sources, or receptive devices, or both, are connected in a number of separate groups in series, and these separate groups subsequently connected in multiple.

**Multiple-Series Condenser.**—(1) An arrangement of groups of condensers in series, which groups are connected in multiple. (2) A condenser divided into parts capable of being connected either in multiple, or in series, or in both.

**Multiple Series-Connected Receptive or Translating Devices.**—A number of

receptive or translating devices connected in multiple-series.

**Multiple-Series-Connected Sources.**—A number of separate electric sources so connected in multiple-series, as to be capable of acting as a single source.

**Multiple-Series Connection.**—Connection in multiple-series.

**Multiple Switch.**—A switch provided with a number of separate contact plates for controlling a plurality of circuits.

**Multiple Switchboard.**—A switchboard to which the numerous circuits employed in systems of telegraphy, telephony, annunciators, or electric light and power circuits, are connected.

**Multiple-Tablet Switchboard.**—A switchboard provided with a number of separate tablets or panels.

**Multiple Telegraphic-Repeater.**—A telegraphic repeater which repeats from one circuit to two or more Morse circuits.

**Multiple Telegraphy.**—A system for the simultaneous telegraphic transmission over the same wire of more than a single message in the same direction.

**Multiple Telephone Receiver.**—(1) A telephone receiver in a multiple telephone circuit. (2) A composite telephone receiver.

**Multiple Telephone Switchboard.**—A switchboard consisting in reality of a number of separate switchboards, each provided with separate operators and bearing transmitter keys, switches and generators, employed when the number of subscribers connected with the switchboard exceed a number such as can be handled by a single switchboard.

**Multiple Telephony.**—The simultaneous transmission over the same wire of a number of separate telephonic despatches, in the same direction.

**Multiple Transformer.**—(1) Any form of transformer the coils or circuits of which are connected in multiple. (2) The ordinary alternating-current transformer connected across a supply circuit, as distinguished from a series transformer.

**Multiple Transmission.**—The simultaneous sending of two or more messages over a single conductor in the same direction.

**Multiple Unit System of Railway Traction.**—A system of electric railways in which each traction unit is provided with its own independent motors, in such a manner that all the units may be operated collectively from a single point.

**Multiple Valued Function.**—A function which has more than one value for a single value of its variable.

**Multiple Wheel Printing Telegraph.**—A printing telegraph instrument provided with a plurality of printing wheels.

**Multiple Windings.**—Independent windings symmetrically disposed upon the same armature, insulated from each other, but brought to different segments of the commutator.

**Multiple-Wound Multiple-Circuit Armature.**—A multipolar armature having a plurality of windings, and each winding having a plurality of circuits between the brushes.

**Multiple-Wound Two-Circuit Armature-Windings.**—A multipolar armature having a plurality of windings, each winding having two circuits between the brushes.

**Multiple Working of Dynamo-Electric Machines.**—A term sometimes used for parallel working of dynamo electric machines.

**Multiples.**—The jacks in the various sections of a multiple-telephone switchboard, which are connected to the same line or subscriber.

**Multiplex Telegraph.**—A general term embracing the apparatus employed in multiplex telegraphy.

**Multiplex Telegraphy.**—(1) A system of telegraphy for the simultaneous transmission in opposite directions of more than two separate messages over a single wire from each end. (2) A term sometimes used for multiple telephony or simultaneous transmission of more than one message in the same direction over a single wire.

**Multiplex Telephony.**—A system of telephony for the simultaneous transmission in opposite directions of more than two separate messages over a single wire from each end.

**Multiplex Working.**—Multiplex transmission.

**Multiplicator.**—A term sometimes used for multiplier.

**Multiply.**—In a multiple telephone switchboard to reduplicate or to repeat at each section of the switchboard.

**Multiply Re-Entrant Armature-Winding.**—An armature-winding provided with a plurality of separate conducting paths or windings, each of which is independently re-entrant.

**Multiplying Power of Shunt.**—A quantity by which the current flowing through

a galvanometer or other device provided with a shunt, must be multiplied, in order to give the total current.

**Multi-Point Secondary.**—A secondary coil arranged so that it can be readily tapped at different points.

**Multipolar Armature.**—An armature suitable for use in a multipolar field.

**Multipolar - Drum Armature-Windings.**—Windings of a drum armature suitable for a multipolar field; i. e. producing more than two poles on the armature surface.

**Multipolar Dynamo.**—A dynamo provided with a multipolar field.

**Multipolar Electric Bath.**—An electrotherapeutic bath in which more than two electrodes are employed.

**Multipolar Field.**—A field produced by more than two separate magnet poles.

**Multipolar Generator.**—A multipolar dynamo.

**Multipolar Motor.**—A motor whose field-magnets contain more than two separate magnet poles.

**Multipolar Railway-Generator.**—A generator having a multipolar field, employed for furnishing current to trolley cars.

**Multipolar-Ring Armature-Winding.**—The winding of a ring armature adapted to a multipolar field.

**Multipolar Winding.**—A winding suitable for use in multipolar generators or motors.

**Multi-Slot Armature-Winding.**—A multi-coil armature winding.

**Multi-Slot Alternating-Current Iron-Clad-Armature.**—An iron-clad armature having more than one slot per field pole and furnishing alternating currents.

**Municipal Series Circuit.**—A series circuit employed for the distribution of incandescent lights and suitable for lighting streets.

**Municipal System of Incandescent Electric Lighting.**—A system for the distribution of incandescent electric lights, in which the separate lamps are connected to the circuit in series, each lamp being provided with a fuse or other automatic cut-out.

**Muscle Currents.**—In electrotherapeutics the electric currents flowing through a muscle during its stimulation or activity.

**Muscular Pile.**—Matteucci's muscular pile.



**Mushroom Anchor.**—An anchor resembling a mushroom in form and used for mooring buoys in submarine cable-work, so as to resist dragging along the sea-bottom and yet avoid becoming tightly engaged in rocks.

**Mushroom Deposit on Negative Carbon.**—A flat deposit of graphitic carbon of a mushroom shape, that forms on the negative carbon of an enclosed arc-lamp.

**Muskot, Electric.**—A gun whose charge is ignited by a platinum wire rendered incandescent by the action of a battery placed in the stock of the gun.

**Mutual Flux of Transformer.**—The magnetic flux which passes through both coils in a transformer as distinguished from magnetic flux which may traverse one coil, when excited to the exclusion of the other.

**Mutual Inductance.**—(1) The coefficient of mutual induction between two conductors. (2) The flux linkages in one circuit due to unit current in the other.

**Mutual Induction.**—(1) Induction produced on each other by two neighboring circuits through the mutual inter-connection of their magnetic fluxes. (2) Induction produced in neighboring charged conductors by the inter-connection of their electrostatic fluxes.

**Myograph.**—An instrument for measuring nervous sensibility.

**Myopia.**—Near-sightedness.

**Myopic.**—Of or pertaining to near-sightedness.

**Myria.**—A prefix for ten thousand times.

## N

**N.**—A symbol for the whole number of lines of magnetic flux or induction in any magnetic circuit.

**N.**—In submarine telegraphy, a code signal at the end of a message to indicate that there are no more messages to follow.

**N.**—A contraction for north-seeking magnetic pole.

**n.**—(1) A symbol employed for frequency. (2) A contraction for a number.

**N. H. P.**—A contraction for nominal horsepower.

**Name Plate.**—A plate fastened to a dynamo-electric machine and bearing the name of the maker and other particulars such as the speed, power, weight, pressure, and current of the machine.

**Narrow-Gauge Street-Railway Motor.**—A street-railway car motor of less breadth than usual, suitable for use on narrow-gauge tracks.

**Nasal Electrode.**—An electrode suitable for introduction into the nostril for its therapeutic treatment.

**Nascent State.**—A term used in chemistry to express the state or condition of an elementary atom or radical when just liberated from chemical combination, when it possesses chemical affinities or attractions more energetic than afterwards.

**Natural Current from Fault in Cable.**—The feeble current originating from the voltaic couple formed at a break or fault in a cable.

**Natural Currents.**—A term sometimes applied to earth currents.

**Natural-Draught Transformer.**—(1) An alternating-current transformer in which an air-space is left between the primary and secondary coils, through which a convection current of air passes on the heating of the coils. (2) A transformer cooled by radiation and convection, as distinguished from an air-transformer.

**Natural Electret.**—A body whose molecules are inherently electrized, as distinguished from a body whose molecules become electrized by induction.

**Natural Law.**—(1) A law of nature. (2) An observed correlation of phenomena such that when one phenomenon or group of phenomena occurs in a certain definite way, another phenomenon or group of phenomena invariably follows.

**Natural Magnet.**—The name sometimes given to a lodestone.

**Natural Period.**—(1) The time in which a cyclic phenomenon naturally completes itself. (2) The time of complete free oscillation of a vibrating substance or condition, when not subjected to external restraint.

**Natural Resultant Fault.**—In any circuit, a fault which is the electrical equivalent in position and magnitude of all the actual small faults or leakages which may be present in that circuit.

**Natural Unit of Electricity.**—(1) A term sometimes used in place of an atomic



charge of electricity. (2) The quantity of electricity carried by a single monad atom of any elementary substance.

**Natural Unit of Quantity of Electricity.**—The quantity of electricity possessed as a charge by any elementary monad atom.

**Naut.**—A nautical mile.

**Nautical Mile.**—(1) A knot or naut, or a distance of 6,087 feet; or nearly 1.15 statute miles. (2) The  $\frac{1}{60}$ th of the earth's equatorial circumference, or  $\frac{1}{25}$ th of a degree of longitude at the equator.

**Nautical Telegraphy.**—Telegraphy conducted at sea or over the sea, either between different vessels or on board a single vessel.

**Near Sightedness.**—(1) Inability to see objects distinctly unless they are comparatively near the eye. (2) Myopia.

**Nebula.**—A misty appearance in the heavens often resolved by a telescope into clusters of innumerable stars.

**Needle.**—A word frequently used for a magnetic needle.

**Needle Annunciator.**—An annunciator whose indications are obtained by the movements of a needle, instead of by the fall of a drop.

**Needle Electrode.**—A needle-shaped therapeutic electrode employed for electrolytic treatment.

**Needle Instrument.**—A single-needle instrument.

**Needle of Oscillation.**—A small magnetic needle employed for measuring the intensity of a magnetic field by the number of oscillations it makes in a given time when disturbed from its position of rest in such field.

**Needle System of Telegraphy.**—A system of telegraphy in which the letters of the alphabet and numerals are indicated by the to-and-fro movements of a magnetic needle.

**Needle Telegraph.**—A general term embracing the apparatus employed in needle telegraphy.

**Needle Telegraphy.**—The needle system of telegraphy.

**Negative Brush of Dynamo.**—The brush connected with the negative terminal of a dynamo.

**Negative Brush of Motor.**—The brush connected with the negative terminal of the driving source.

**Negative Bus-Bars.**—The negative omnibus bars.

**Negative Charge.**—(1) According to the double-fluid hypothesis, a charge of negative electricity. (2) According to the single-fluid hypothesis, any deficit of an assumed electric fluid. (3) An electric charge of the same character as that produced on silk when rubbed by glass.

**Negative Conductor.**—The conductor connected to the negative terminal of an electric source.

**Negative Currents.**—In telegraphy, a term applied to the currents sent over a line from the negative pole of the battery.

**Negative Direction of Electrical Convection of Heat.**—A direction in which heat is transmitted by electric convection, through an unequally heated conductor opposite to that of an electric current.

**Negative Direction of Simple Harmonic Motion.**—Simple-harmonic motion in which the generating circle is moved over in the negative direction.

**Negative Electricity.**—(1) One of the phases of electric excitement. (2) The kind of electric charge produced on resin when rubbed with cotton.

**Negative Electromotive Force.**—Such an E. M. F. as is produced at the free pole of a battery or other source whose positive pole is grounded.

**Negative Electrification.**—(1) The charging of a body with negative electricity. (2) A negative charge.

**Negative Electrode.**—The electrode connected with the negative terminal of a source.

**Negative Element of Electrolyte.**—(1) The element which in electrolysis appears at the positive electrode. (2) The cathion.

**Negative Element of Voltaic Cell.**—(1) That element of a voltaic couple which is not acted on by the electrolyte. (2) The element which forms the positive pole of the cell above the surface of the electrolyte.

**Negative Feeders.**—The feeders connecting the negative mains with the negative poles of the generators.

**Negative Fluid.**—(1) A specific fluid which was formerly believed by the advocates of the double-fluid electric hypothesis to be the cause of negative excitement. (2) A deficit of an assumed single electric fluid.

**Negative Inductance.**—A capacitance.

**Negative Lightning.**—A name given to a variety of lightning discharge whose existence is apparent in some photo-

graphic negatives of lightning flashes, as black branches coming out from the main-lightning stem.

**Negative Omnibus-Bar.**—The bus-bar connected to the negative terminals of the generators.

**Negative Phase of Electrotonus.**—A decrease in the electromotive force of a nerve, produced by sending an electric current through the nerve in the opposite direction to the nerve current.

**Negative Plate of Storage Cell.**—(1) That plate of a storage cell which is converted into or partly covered with a coating of spongy lead by the action of the current. (2) That plate of a storage cell which is connected with the negative terminal of the charging source, and which is, therefore, the negative pole of the cell on discharging.

**Negative Plate of Voltaic Cell.**—(1) The electro-negative element of a voltaic couple. (2) That element of a voltaic couple which is negative in the electrolyte of the cell. (3) That portion of the plate of a voltaic cell above the liquid, which becomes the positive pole of the cell.

**Negative Pole of Receptive Device.**—That pole of a receptive device which is connected to the negative pole of a source.

**Negative Pole of Source.**—That pole of an electric source through which the current is assumed to enter, or flow back into the source, after having passed through the circuit connected to the source.

**Negative Potential.**—(1) A potential such as determines a tendency of electricity to flow towards it from the earth or from any point of positive potential. (2) Generally, the lower potential or lower level. (3) That property of a point in space by virtue of which electric work is done by the movement of a small positive charge to that point from an infinite distance.

**Negative Rays.**—The molecular streams given off at the negative electrode or cathode of an induction tube, on the passage of electric discharges through the tube.

**Negative Resistance.**—A property of a circuit or conductor containing an E. M. F., whereby a current flowing through the conductor rises in pressure instead of falling.

**Negative Rotation.**—Right-handed or clockwise rotation, as viewed from in front of the clock.

**Negative Side of Circuit.**—(1) The side of a circuit opposite to the positive side. (2) That side of a circuit bent in the form of a circle, from which, if an observer stood with his head in the negative region, he would see the current pass around him clockwise, or right-handedly. (3) The side of a circuit connected with the negative pole of the source.

**Negative Spark.**—The spark produced by the discharge of a negatively charged conductor.

**Negative Terminal.**—(1) The terminal of a voltaic cell connected with the positive plate or element. (2) The terminal of a source connected with the negative pole. (3) The terminal of a translating device connected with the negative pole of the source.

**Negative Wire.**—(1) A wire charged, or intended to be charged, negatively. (2) A wire connected with the negative pole of a source. (3) A wire of negative potential.

**Negatively Excited.**—Endowed with a negative charge.

**Net Efficiency.**—The final or ultimate efficiency of a series of machines or translating devices, through which energy, or any other quantity, has to successively pass, as distinguished from the separate efficiency of each machine or device.

**Netted Globe.**—A globe surrounding an arc-lamp and provided with an external netting.

**Netting Wire.**—A wire net-work shield inclosing the globe of an arc-lamp, both to protect it from mechanical injury and to prevent glass from falling in case of fracture.

**Network of Conductors.**—A term applied to a number of interconnected conductors which may resemble a net in appearance.

**Network of Currents.**—A term sometimes applied to a number of shunts or derived circuits, or to the currents which flow in a network of conductors.

**Neutral Armature.**—A non-polarized armature.

**Neutral Ampere-Meter.**—An ampere-meter connected with the neutral bus-bar in a three-wire system of distribution.

**Neutral Conductor.**—The neutral wire in a three-wire system.

**Neutral Feeder.**—In a three-wire system, a feeder connected with the neutral bus-bar.

**Neutral-Line of Magnet.**—The equator of a magnet.

**Neutral-Line of Commutator Cylinder.**—A line on the commutator cylinder of a dynamo connecting the neutral points or points of zero potential.

**Neutral-Line of Dynamo Armature.**—(1) A line passing through the armature, symmetrically disposed as regards its entering and emerging flux. (2) A line of zero polarity.

**Neutral Omnibus-Bar, or Bus-Bar.**—In a three-wire system of distribution, the bus-bar connected with the neutral dynamo terminals, or the terminals uniting the positive and negative dynamos.

**Neutral Point.**—A term sometimes employed in electro-therapeutics for indifferent point.

**Neutral Points of Magnet.**—(1) Points approximately midway between the poles of a magnet. (2) Points of zero polarity.

**Neutral Points of Dynamo-Electric Machine.**—(1) Two points situated on the commutator cylinder at opposite ends of its diameter at which the collecting brushes must rest in order to obtain sparkless commutation. (2) Points of zero potential on a commutator.

**Neutral Points of Thermo-Electric Diagram.**—(1) The points on a thermo-electric diagram where the lines representing the thermo-electric powers of any two metals cross each other. (2) A mean temperature for any two metals in a thermo-electric series, at which, if their two junctions are slightly over or slightly under the mean temperature, the one as much above as the other is below, no effective electromotive force is developed.

**Neutral Relay-Armature.**—(1) A relay armature consisting of a piece of soft iron which closes a local circuit whenever its electro-magnet receives an impulse over the main line. (2) A normally unmagnetized relay armature.

**Neutral Section of Magnet.**—A section passing through the neutral line or equator of a magnet.

**Neutral Salt.**—A salt possessing neither acid nor basic properties.

**Neutral Solution.**—A solution of neutral salt.

**Neutral Wire.**—(1) In a three-wire system of electric distribution the wire connected to the neutral dynamo-terminal. (2) The balance wire of a three-wire system.

**Neutral-Wire Ampere-Meter.**—An am-

pere meter placed in the circuit of a neutral wire, in a three-wire system, for the purpose of showing the excess of current passing over one side of the system as compared with the other side, when a balance between the two is no longer maintained.

**Neutral Zone of Charged Insulated Conductor.**—That portion of an insulated conductor, charged by electrostatic induction, which lies approximately midway between its positive and negative end.

**Neutral Zone of Magnet.**—A term sometimes employed for equator of magnet.

**Neutralization.**—The act or quality of rendering neutral, as in the discharge of an electrified body.

**New Ohm.**—A term sometimes used for the international ohm.

**Nib on Carbon Electrode.**—A term sometimes employed for the graphitic deposit on one side of the negative carbon, when the arc has been maintained between the sides of two parallel carbon electrodes.

**Nickel Bath.**—An electrolytic bath containing a readily electrolyzable salt of nickel, a plate of nickel acting as the anode of the battery, and placed in a liquid near the object to be coated, which forms the cathode.

**Nickel Facing of Electro-Type.**—A thin electro-plating of nickel deposited on the surface of an electro-type for the purpose of hardening it.

**Nickel Plating.**—Electro-plating with nickel.

**Niello-Work.**—An enamelling process in which a pattern is traced upon a bright silver surface with a silver sulphide, or with mixtures of lead, copper and silver sulphide, artificially prepared, and which is afterwards fixed, by heating to the fusion point.

**Nigger.**—A term sometimes employed for a fault in any electric apparatus or system.

**Night-Bell.**—In a hotel or telephone exchange, a bell switched into connection with a shunted circuit of an annunciator case, and intended, by its constant ringing, to call the attention of the night operator to the falling of a drop.

**Night-Switch for Telephone.**—A switch so arranged that, when turned to the on-position, any or all of the drops will, on falling, ring a bell, and thus call the attention of the operator.

**Nipple of Negative Carbon.**—A tiny



projection of graphitic carbon, deposited during the maintenance of the arc, on the surface of the negative carbon opposite the crater of the positive carbon.

**No. 1 Side of Quadruplex System.**—That side of the quadruplex system which is employed in operating the polar duplex system.

**No. 2 Side of Quadruplex System.**—That side of a quadruplex system which contains the increment key and neutral relay.

**Nobili's Rings.**—Metallo-chromes.

**Nodal Point.**—A point in a vibrating string or wire free from vibration.

**Node.**—A nodal point.

**Nodes, Electric.**—(1) Points in a circuit or conductor through which electric oscillations are passing, which possess a constant value of potential, while the potential at the internode alternates between two fixed limits. (2) Points in a conductor where the strength of the induced oscillatory current is equal to zero.

**Nodular Electro-Metallurgical Deposit.**—A coherent electro-metallurgical deposit, of irregular outline, which occurs whenever the current density falls below its normal value.

**Noise.**—(1) Any discordant assemblage of musical tones. (2) Any sound of too short duration to permit its pitch to be readily distinguished.

**Noisy Arc.**—A voltaic arc whose maintenance is attended by frying, hissing or spluttering sounds.

**Nominal Candle-Power.**—A term sometimes applied to the candle-power of a luminous source taken in a favorable direction.

**Non-Arcing Arrester.**—A non-arcing lightning arrester.

**Non-Arcing Fuse.**—A fuse wire formed of non-arcing metal, which, therefore, blows without the formation of a voltaic arc.

**Non-Arcing Metal.**—An alloy formed of mixtures of a certain group of metals, which, under certain conditions, will not permit the maintenance of an alternating-current arc between them.

**Non-Arcing-Metal Lightning-Arrester.**—A lightning arrester employing electrodes of non-arcing metals.

**Non-Arcing Metals.**—Metals forming non-conducting oxides such that an alternating-current arc is interrupted between them under certain conditions.

**Non-Automatic Repeater.**—A manual repeater.

**Non-Automatic Variable Resistance.**—A resistance, the value of which is regulated by hand.

**Non-Conductor.**—Any substance whose conductivity is low, or whose electric resistance is great.

**Non-Coperiodic.**—(1) Non-synchronous. (2) Devoid of coperiodicity. (3) Not isochronous. (4) Having a period differing from the period considered.

**Non-Coperiodic Electromotive Forces, Currents and Fluxes.**—Electromotive forces, currents, or fluxes that are of different periods or frequencies.

**Non-Electrics.**—A term formerly applied to substances like the metals or other good conductors, which appeared not to be capable of electrification by friction.

**Non-Ferrie.**—Devoid of iron.

**Non-Ferrie Inductance.**—(1) The inductance possessed by a circuit which does not contain, or is not magnetically associated with, iron. (2) The inductance of a coil with a non-magnetic core.

**Non-Ferrie Inductance-Coil.**—An inductance coil devoid of iron.

**Non-Ferrie Magnetic Circuit.**—(1) A magnetic circuit devoid of iron. (2) A magnetic circuit containing only air, wood, copper or other non-magnetic materials.

**Non-Homogeneous Current-Distribution.**—(1) A distribution of current passing through a conductor, in which there is an unequal density of current over any cross-section of the conductor. (2) The skin effect.

**Non-Illumined Electrode.**—That electrode of a selenium cell which is protected from the direct action of light.

**Non-Inductive Load.**—(1) An inductionless load. (2) A load consisting of resistance.

**Non-Interfering Fire Telegraph.**—A system of fire alarm telegraphy in which two calls, simultaneously delivered, are incapable of interfering with each other.

**Non-Interfering Street Signal Box.**—A street signal box connected with a central station for the delivery of an alarm, in such a manner that two signals given at the same time from two different boxes will not interfere with each other.

**Non-Inductive Resistance.**—A resistance devoid of self-induction.

**Non-Isotropic Expansion.**—A property possessed by some crystalline substance of unequal expansion along different axes.



**Non-Luminous Radiation.**—Radiation incapable of affecting the eye.

**Non-Luminous Heat Radiation.**—(1) Heat radiation devoid of frequencies capable of exciting or producing the sensation of light. (2) Heat radiation devoid of luminous frequencies.

**Non-Magnetic Steel.**—Certain alloys of iron, such as manganese steel, or nickel steel, that are practically devoid of the ability of being magnetized.

**Non Multiple Telephone Switchboard.**—(1) A telephone switchboard which is either not so large as to have rendered reduplication necessary, or which operates upon a system in which reduplication is dispensed with. (2) A single telephone-switchboard.

**Non-Oscillatory.**—(1) Not characterized by oscillations. (2) Maintaining the same direction of motion throughout.

**Non-Oscillatory Charge.** A charge obtained by means of non-oscillatory electromotive forces or currents.

**Non-Oscillatory Charging.**—Charging uniformly by currents which are always of the same direction, as opposed to charging with oscillations in which the currents alternate.

**Non-Oscillatory Current.**—(1) A current that is devoid of periodic oscillation. (2) A uniform current.

**Non Oscillatory Discharge.**—A steady discharge, or one characterized by freedom from periodic oscillation.

**Non-Oscillatory Intermittent Current.**—A current which is intermittent, but always in the same direction, as distinguished from an oscillatory current whose direction alternates.

**Non-Overlapping Winding of Alternator.**—A winding in which the coils are mechanically separate and do not overlap.

**Non Periodic Alternating-Current.**—An alternating current whose intensity varies non-periodically.

**Non-Periodically Varying Current.** A continuous current whose strength is subject to non-periodical oscillations.

**Non-Polar Transformer.**—A term sometimes used for a closed iron-circuit transformer.

**Non-Polarizable.**—Incapable of polarization.

**Non-Polarizable Electrodes.**—Electrotherapeutic electrodes constructed so as to avoid the effects of polarization.

**Non-Polarized Armature.**—An arma-

ture of soft iron which is attracted towards the poles of an electro-magnet on the completion of the circuit, no matter in what direction the current passes through the coils.

**Non-Reactive Circuit.**—A circuit which possesses neither inductance nor capacity, and, therefore, has ohmic resistance only.

**Non-Sinusoidal Currents.**—Alternating currents that are not of the true sinusoidal type.

**Non-Synchronous Motor.**—(1) An asynchronous motor. (2) An alternating-current motor capable of starting at any load. (3) An induction motor. (4) An alternating-current motor which is not compelled to run in synchronism with its driving current.

**Non-Uniform Magnetic Flux.**—Magnetic flux whose density varies in different portions of the magnetic circuit.

**Non-Vibrating Filament Lamp.**—An incandescent lamp with an anchored filament.

**Normal.**—(1) Perpendicular to. (2) In accordance with rule. (3) Regular.

**Normal Current.**—The current strength at which a system or apparatus is designed to be operated.

**Normal Earth-Current.**—The usual earth current.

**Normal Magnetic-Day.**—A day during which the values of the earth's magnetic elements do not vary greatly from their mean value.

**Normal Voltage.**—The voltage at which a system or apparatus is designed to be operated.

**Normal Voltaic-Arc.**—A voltaic arc whose characteristic properties are those possessed by the ordinary arc.

**North Magnetic Pole.**—That pole of a magnetic needle which points approximately to the earth's geographical north.

**North-Seeking Magnetic Pole.**—(1) The north magnetic pole. (2) That pole of a magnet which turns towards and approximately points to the north geographical pole of the earth.

**Northern Lights.**—(1) Luminous sheets, columns, arches or pillars of pale, flashing light, generally of a reddish color, seen in the northern heavens. (2) The aurora borealis.

**Nose Suspension of Motor.**—The suspension of a motor in a car truck by a projecting hook or nose from above, as distinguished from a suspension by a bar and spring from beneath.

**Null or Zero Method.**—(1) Any method employed in electrical measurements in which the values are determined by balancing against them equal similar values, and ascertaining such equality not by the deflection of the needle, but by the absence of such deflection. (2) Any method of measurement in which the criterion is no indication on the instrument employed, as distinguished from a method

depending upon the amounts or quantitative values of such indications.

**Null Point.**—(1) Such a point on a micro-meter circuit that when joined or connected with the secondary circuit of an induction coil, the sparks in the micro-meter circuit are either very greatly decreased, or are entirely absent. (2) A nodal point.

## O

**O.**—An abbreviation for ohm, the practical unit of resistance.

**O. K.**—A telegraphic signal of acquiescence meaning "all right," and said to be a perversion of the initial letters of the phrase "all correct."

**Ω.**—A contraction for megohm.

**ω.**—A contraction for ohm.

**ω.**—A symbol sometimes employed for angular velocity.

**O. cm.**—An abbreviation proposed for ohm-centimetre, a standard of resistivity or conductivity.

**Oblique Induction.**—In the air gap of a dynamo, magnetic induction which is deflected from the perpendicular to the polar surface by armature reaction.

**Obscure Heat.**—Non-luminous heat.

**Observation Mine.**—A variety of submarine mine that is fired from a distant point when an enemy's vessel is observed to be within its destructive area.

**Obtuse Angle.**—Any angle whose value is greater than 90°.

**Ocluded-Gas Process.**—A process for the removal of the residual atmosphere from a vacuum tube, or from the chamber of an incandescent electric lamp, consisting in heating the same to a high temperature while connected with the pumps, before sealing off.

**Oclusion of Gas.**—The absorption or condensation of a gas in the pores or on the surfaces of various substances.

**Ocean Cable.**—A submarine cable.

**Octo-Polar Dynamo.**—A multi-polar dynamo whose field has eight poles.

**Octo-Polar Field.**—A field produced by the flux of eight separate magnet poles.

**Od.**—The name given by Reichenbach to the assumed force which he claimed to be the cause of animal magnetism.

**Odd Harmonics.**—In a complex harmonically varying quantity, the harmonics

whose frequencies are odd multiples of the fundamental frequency.

**Odorscope.**—An apparatus in which the determination of an odor was attempted by the measurement of the effect its vapor or effluvia produced on a contact resistance.

**Odylic.**—Of or pertaining to the od force.

**Odylic Rays.**—Rays accompanying the od force, which, according to Reichenbach, were emitted from magnet poles, and various other bodies, and were capable of producing faint luminous sensations in people sufficiently sensitive to their influence.

**Oersted.**—(1) The name proposed for the C. G. S. unit of magnetic reluctance. (2) The reluctance offered to the passage of magnetic flux by a cubic centimetre of air when measured between parallel faces.

**Off Position of Switch.**—(1) That position of a switch in which it throws a device or a portion of a circuit off from the working circuit. (2) The break position of a switch.

**Office Cable.**—(1) A cable of insulated wires suitable for indoor office-work. (2) A cable leading to a telegraph office.

**Office Loop.**—(1) In telegraphy, a loop, or two wires running to an office. (2) In telegraphy, a loop or pair of wires running from a circuit in an office to some desk in the same office, as distinguished from a loop running to some distant point.

**Offset.**—A side connection, or lateral, taken from a conduit or cable for connection to a service.

**Ohm.**—(1) The practical unit of electric resistance. (2) Such a resistance as would limit the flow of electricity under an electromotive force of one volt, to a current of one ampere, or one-coulomb-per-second. (3) A value equal to  $10^9$  or 1,000,000,000 absolute electro-magnetic units. (4) A value which is represented

conventionally in C. G. S. units by a velocity of  $10^9$  or 1,000,000,000 centimetres per second.

**Ohmage.**—The value of an electric resistance expressed in ohms.

**Ohmic.**—(1) Of or pertaining to the ohm. (2) Having the nature of an electric resistance.

**Ohmic Drop.**—The drop in pressure due to the ohmic resistance.

**Ohmic Resistance.**—(1) The true resistance of a conductor due to its dimensions and conductivity, as distinguished from the spurious resistance produced by counter-electromotive force. (2) A resistance such as would be measurable in ohms by the usual methods of continuous-current measurement.

**Ohm-Motor.**—A commercial galvanometer employed for practically measuring, by the deflections of a magnetic needle, the resistance of any part of a circuit to which it is connected, and through which a current flows.

**Ohm Mile.**—(1) A standard of conductivity of wire, one mile in length and having a resistance of one ohm at a standard temperature. (2) The product of the weight of a mile of wire and its resistance in ohms at a given temperature. (3) Such a mass of a substance, at a standard temperature, as would enable a uniform wire of that substance, one mile in length, to offer a resistance of one ohm.

**Ohm's Law.**—The strength of a continuous electric current in any circuit is directly proportional to the electromotive force acting on that circuit, and inversely proportional to the resistance of the circuit.

**Oil-Cooled Transformer.**—A transformer that is cooled by means of oil.

**Oil Cup.**—A cup filled with lubricating oil, so supported that its oil is slowly fed to a shaft and bearing, or in general, to the rubbing parts of a machine.

**Oil Guard.**—(1) A guard of sheet metal supported so as to catch any drops of oil that may be thrown upon its surface, and thus protect any person or apparatus. (2) A guard placed over a direct-driven dynamo, to prevent oil from being thrown on it by the revolving engine.

**Oil-Insulated.**—Insulated by means of oil.

**Oil Insulator.**—A fluid insulator containing oil.

**Oil Insulator for Storage Battery.**—An oil insulator provided for the support of a storage battery.

**Oil Paper.**—An insulating material con-

sisting of paper that has been soaked in an insulating oil.

**Oil Transformer.**—(1) A transformer immersed in oil in order to ensure and maintain high insulation. (2) An oil-insulated transformer.

**Okonite.**—A variety of insulating material.

**Olvetto Box.**—A box containing an arc-lamp provided with an aperture closed by colored glass, and employed for the purpose of obtaining a uniform field of color over a large surface, such as a stage scene.

**Omnibus Bars.**—(1) Heavy bars of copper connected directly to the poles of a dynamo in a central station, and, therefore, receiving their entire current. (2) Main conductors common to two or more dynamos in an electrical generating plant.

**Omnibus Wires.**—A word sometimes used for bus-bars.

**On Position of Switch.**—(1) That position of a switch in which it throws a device, or portion of a circuit, on to a working circuit. (2) The make position of a switch.

**One-Coil Transformer.**—A word sometimes employed for auto-transformer.

**One-Fluid Voltaic Cell.**—A name sometimes given to a single-fluid voltaic cell.

**One-Layer Armature-Winding.**—(1) An armature winding consisting of but a single layer of wire. (2) A winding which, although it may consist of several layers, would be possible of application in a single layer, as distinguished from a two-layer armature which must be laid in two layers.

**One-Metal Cell.**—An identical electrode cell. (2) A cell in which both elements are composed of one metal.

**One-Way Door-Trigger.**—A door-trigger which operates on the opening of the door only.

**Opacity.**—Possessing the property of non-transparency to radiation.

**Open-Arc.**—A non-enclosed voltaic arc.

**Open-Box Conduit.**—A conduit consisting of an open box of wood placed in a trench and closed with a wooden cover, after the introduction of the cable.

**Open Car-Wheel.**—A form of car-wheel in which the space between the flange and the axle is provided with asymmetrical perforations.

**Open Circuit.**—A broken circuit, or a circuit whose conducting continuity is broken.

**Open-Circuit Battery.**—A voltaic bat-



tery which is normally on open circuit, and which is used continuously on closed circuit only for comparatively small portions of time.

**Open-Circuit Burglar-Alarm.**—A burglar alarm whose battery is normally on open circuit, and is brought into action on the closing of such circuit as a door, window, or other point.

**Open-Circuit Current of Transformer.**—A term sometimes employed for the leakage current of a transformer.

**Open-Circuit Electric Oscillations.**—Electric oscillations produced in open circuits by the presence of electric surges in neighboring circuits.

**Open-Circuit Induction.**—The induction produced in an open circuit by means of electric surges in neighboring circuits.

**Open-Circuit of Triphase Connections.**—The star-connection of triphase circuits.

**Open-Circuit Single-Current Signaling.**—A system of single-current signaling in which the signaling batteries placed at each station are in circuit during signaling only.

**Open-Circuit Thermostat.**—A thermostat maintained normally on an open-circuit.

**Open-Circuit Transformer.**—(1) A transformer whose magnetic circuit is partly completed through air. (2) An aero-ferrie-circuit transformer.

**Open-Circuit Voltaic Cell.**—A voltaic cell that cannot be kept on closed circuit with a comparatively small resistance, for any considerable time, without serious polarization.

**Open-Circuit Voltmeter.**—(1) A voltmeter in which the points of a circuit where the potential difference is to be measured, are connected with an open-circuit to give indications by means of the charges so produced. (2) An electrometer-voltmeter.

**Open-Circuited.**—Provided with an open or broken circuit.

**Open-Circuited Conductor.**—(1) A conductor not forming a closed circuit. (2) A conductor not closed on itself, and whose metallic continuity, therefore, is not complete, but through which an oscillatory discharge is capable of passing.

**Open-Circuited Discharge.**—A discharge taking place through a circuit whose metallic continuity is incomplete.

**Open-Circuited Oscillation.**—An electric oscillation or surging taking place in an open-circuited conductor.

**Open-Circuit Thermostat.**—A thermostat maintained normally on an open-circuit.

**Open-Circuited Transformer.**—An aero-ferrie-circuit transformer.

**Open-Coil Armature.**—An armature, some of whose coils are on open-circuit during a portion of the rotation of the armature.

**Open-Coil Armature-Windings.**—The windings of an open-coil dynamo armature.

**Open-Coil Disc Dynamo-Electric Machine.**—(1) A disc-wound dynamo-electric machine whose armature is an open-circuited during part of each revolution. (2) An open-coil dynamo-electric machine, the armature of which is disc shaped.

**Open-Coil Drum Dynamo-Electric Machine.**—An open-coil dynamo-electric machine, the armature of which is drum-wound.

**Open-Coil Dynamo.**—A dynamo provided with an open-coil armature.

**Open-Coil Ring Dynamo-Electric Machine.**—An open-coil dynamo-electric machine, the armature of which is ring-wound.

**Open-Iron-Circuit Converter.**—An open-iron circuit transformer.

**Open-Iron-Circuit Transformer.**—An aero-ferrie transformer.

**Open-Iron-Magnetic Circuit.**—An aero-ferrie magnetic circuit.

**Open Magnetic Core.**—Any iron core which forms a portion of an aero-ferrie circuit.

**Open Trolley-Car.**—A trolley-car open on the sides and ends.

**Open-Wire Symmetrical Twist.**—A system of stringing aerial telephone wires, so as to avoid cross talk, in which all the wires on a pole are helically twisted right-handedly along the line, one step being taken at each successive pole.

**Open Wiring.**—(1) Wiring that has been purposely left exposed to view. (2) Wiring supported on cleats or insulators, as distinguished from channelled, paralleled, or covered wiring.

**Open Work.**—Open wiring.

**Opening a Circuit.**—Breaking a circuit.

**Opening Shock.**—The physiological shock produced on opening or breaking an electric circuit containing self-induction.

**Operator's Head Telephone.**—A head-gear telephone.



- Operator's Position.**—The space or position allotted to each operator in front of a multiple telephone switchboard.
- Operator's Set.**—A telephone set at a central station employed by the operator.
- Operator's Shelf.**—A shelf at, on, or above a multiple telephone switchboard for supporting the apparatus used by the operators.
- Ophthalmoscope.**—An apparatus for examining the living retina.
- Ophthalmoscopic.**—Of or pertaining to the ophthalmoscope.
- Opposed Electromotive Forces.**—Electromotive forces that are opposed either to each other or to some other already existing electro-motive force.
- Opposed Magnetomotive Forces.**—Magnetomotive forces that are opposed either to each other, or to some other already existing magnetomotive force.
- Optic Angle.**—The angle contained between the optical centres of both eyes at any point to which they may be directed.
- Optic Axis.**—(1) The right line passing through the eye, so that the eye is symmetrical on all of its sides. (2) The axis of symmetry of a crystal. (3) The principal axis of the eye, or its axis of figure.
- Optic Nerve.**—The nerve of vision.
- Optics.**—That branch of physics which treats of the properties and phenomena of light.
- Optical Bench.**—A graduated support employed for varying the distance between fixed and movable optical appliances.
- Optical Efficiency of Light.**—The ratio between the obscure and the luminous radiation.
- Optical Galvanometer.**—A galvanometer whose indications are based on the magnetic rotary power of liquids.
- Optical Strain.**—A deformation produced in a plate of glass, or other transparent medium, by the action of a stress, attended by a change in some of the optical properties of such medium.
- Optical Telegraph.**—A name sometimes applied to a semaphore.
- Oral Annunciator.**—An electric annunciator that is operated by a puff of breath transmitted through an ordinary speaking tube.
- Ordinary Jacks.**—In a multiple telephone switchboard, the reduplicated jacks of each subscriber appearing successively in each section, as distinguished from the local or answering jack, which appears at a single panel.
- Ordinary Lines.**—The lines used for conversation in a call-wire system of telephony, as distinguished from the wires employed for calling.
- Ordinate.**—In graphics, a distance taken on a line called the axis of ordinates.
- Ordinary Relay.**—A non-polarized relay.
- Organ, Electric.**—A wind organ in which the escape of air into the different pipes is electrically controlled, or propelled.
- Orientation of Magnetic Needle.**—The coming to rest of a magnetic needle in the direction of the earth's magnetic flux.
- Originating Call.**—The call of the subscriber who asks to be connected with some other subscriber, as distinguished from any other call which may follow in the process of securing connection.
- Originating Operator.**—In telephonic communication passing through more than one exchange, the operator who is nearest to the calling subscriber, and consequently the operator who first delivered the call, as distinguished from other operators whose assistance may have been called in.
- Oscillating Current.**—(1) An oscillatory current. (2) A periodically alternating current usually of diminishing amplitude.
- Oscillating-Current Transformer.**—A transformer operated by an oscillating current.
- Oscillating Discharge.**—An oscillatory discharge.
- Oscillating Needle.**—A needle of oscillation.
- Oscillation.**—A to-and-fro motion or vibration.
- Oscillation of a Function.**—The difference between the greatest and the least values which a function assumes in a given interval.
- Oscillations, Electric.**—(1) The series of partial intermittent discharges of which the apparent instantaneous disruptive discharge of a Leyden jar, through a small resistance, consists. (2) Free electric vibrations of a disturbed electric system. (3) Electric surges.
- Oscillator.**—Any device for producing oscillations.
- Oscillator, Electric.**—A device for producing electric currents of a constant period, independently of variations in its driving force.
- Oscillatory.**—Vibratory, or characterized by periodic to-and-fro movements.
- Oscillatory Charging.**—Charging by

means of an oscillatory electromotive force or current.

**Oscillatory Current.**—A current which oscillates or performs periodic vibrations usually of diminishing amplitude.

**Oscillatory Discharge.**—(1) An apparently instantaneous discharge of a Leyden jar or condenser, which in reality consists of a number of successive discharges. (2) A discharge which periodically decreases by a series of oscillations.

**Oscillatory Dynamo.**—A dynamo whose armature coils have electromotive forces generated in them by a vibratory or oscillatory motion through a magnetic field, instead of the usual rotary motion.

**Oscillatory Electric Displacement.**—A displacement of an oscillatory character produced in a dielectric.

**Oscillatory Electric Inductance.**—Oscillatory inductance.

**Oscillatory Electromotive Force.**—A rapidly periodic electromotive force, usually rapidly diminishing in amplitude.

**Oscillatory Generator.**—An oscillatory dynamo.

**Oscillatory Inductance.**—Inductance in the circuit of electric oscillations.

**Oscillatory Induction.**—A name sometimes applied to open-circuit induction.

**Oscillatory Intermittent Currents.**—Intermittent currents which are oscillatory in character, such as the oscillatory discharges of a static machine.

**Oscillograph.**—(1) An instrument for recording rapid variations of an electrical current or pressure, usually consisting of a combination of a suitable form of galvanometer with a photographic recording apparatus. (2) A cathode-ray tube in which the cathode rays are deflected by the application of a magnetic field.

**Osmometer.**—An apparatus for measuring osmose.

**Osmose.**—An unequal mixing of liquids of different densities through the pores of a separating medium.

**Osmose, Electric.**—The unequal difference of diffusion between two liquids placed on opposite sides of a diaphragm, produced by the passage of an electric current through the diaphragm.

**Osmosis.**—A term sometimes used for osmose.

**Osmotic.**—Of or pertaining to osmose.

**Osmotic Pressure.**—(1) The pressure produced by osmose. (2) The virtual gaseous pressure of a dissolved substance.

**Osmotic Pressure.**—(1) Pressure produced

by osmose. (2) Pressure in a solution due to the presence of a dissolved substance.

**Osteotome, Electric.**—An electrically propelled circular saw employed in the surgical cutting of bones.

**Outboard Bearing.**—(1) A journal bearing projecting beyond the base frame of a machine for giving adequate support to a long or heavy shaft. (2) A separate journal bearing supported outside the frame of a machine.

**Outboard Bearing of Dynamo-Electric Machine.**—(1) A bearing projecting beyond the base frame of a dynamo-electric machine for the purpose of adequately supporting the rotor. (2) A bearing for the shaft of a dynamo rotor supported independently of the base of the dynamo.

**"Out-Current" of Telephone Relay.**—The current which is sent out by a telephone relay or repeater.

**"Out-Door" Transformer.**—A transformer placed outside a building on the sides of its walls, or on suitably selected posts.

**Outers.**—(1) The outside conductors of a three-wire system as distinguished from the neutral conductor. (2) In telephony, the external pair of springs of a telephone jack.

**Outgoing Call.**—A call issued from an exchange, as distinguished from an incoming call.

**Outgoing-Call Trunk-Line.**—A trunk line terminating at a central telephone station and conveying calls which are transmitted from the station, as distinguished from an incoming call line on which such calls are received.

**Outgoing Current.**—The current sent out over a line from a station as distinguished from the received current, or the returning current.

**Outgoing End.**—The end of a junction telephone wire at which calls are transmitted.

**Outgoing Lines.**—(1) Lines in a telephone exchange on which calls are forwarded or transmitted, as distinguished from incoming lines. (2) Outgoing wires.

**Outgoing Side of Telephone Switchboard.**—(1) The side of a switchboard at which the conductors leave it. (2) The side of a switchboard to which calls are transferred or from which calls are transmitted.

**Outgoing Signals.**—Signals sent out over

a telegraphic line by the outgoing currents.

**Outgoing Wires.**—Wires by means of which the current is led out from a generator or station.

**Outlet.**—(1) A place where branch wires come out in a wall or ceiling for connection to a switch, lamp or other device. (2) In a system of incandescent-lamp distribution, the places in a building where the fixtures or lamps are attached.

**Outlet Block.**—(1) A fuse block placed at or near an outlet. (2) A block containing an outlet fuse wire.

**Outlet Box.**—A box placed at or near an outlet for the ready making or changing of electric connections with the outlet conductors.

**Outlet Insulator.**—Any insulator employed at an outlet.

**Output.**—The useful energy or activity given out by any machine.

**Output of Dynamo-Electric Machine.**—(1) The electric power of the current developed by a dynamo-electric generator or transformer, at its delivery terminals expressed in volt-amperes, watts, or kilowatts. (2) The available mechanical power developed by a motor, or the power delivered at its pulley or shaft.

**Output Wires.**—Wires connected with a distribution box which take their supply from the box.

**Outtrigger.**—An arm horizontally fastened to a pole for the purpose of trussing it.

**Outtrigger for Arc-Lamp.**—A device for suspending an electric arc-lamp so as to cause it to stand out from the wall of a building.

**Outtrigger Torpedo.**—A pole or spar torpedo.

**Outside Wiring.**—(1) Any wiring for a circuit outside of a house or other building. (2) Out-door wiring.

**Outside Work.**—Out-of-door wiring.

**Over-Compounded.**—Such a compounding of a dynamo electric machine as produces under an increase of load an increase of voltage at its terminals.

**Over-Compounded Dynamo.**—A dynamo in which the magneto-motive force of its series coils not only compensates for the drop in the armature, but also for the drop in a conductor leading from the generators to the motors or translating devices, thus permitting the external conductors to be regarded electrically as forming an extension of the armature winding, and thus permitting the genera-

tor to deliver a constant pressure at its final terminals at the motor or device.

**Overflow of Leyden Jar.**—A term sometimes employed for the discharge of a Leyden jar by a disruptive discharge around its edge.

**Overhead Conductor.**—An aerial conductor.

**Overhead Feeders.**—Aerial feeders, as distinguished from buried or underground feeders.

**Overhead Lines.**—A term applied to aerial telegraph, telephone, electric light or power lines, that run overhead, in contradistinction to similar underground lines.

**Overhead Mains.**—Any system of aerial mains.

**Overhead Switch.**—(1) A switch controlling an overhead circuit. (2) A canopy switch. (3) A switch placed overhead. (4) A switch placed above a motor-man on a car so as to be within his reach.

**Overhead Trolley-System.**—(1) An aerial trolley wire system. (2) A system of electric-street-car propulsion in which the required current is taken from an overhead trolley-wire.

**Overhead Trolley-Wire.**—An ordinary aerial trolley wire.

**Overhead Trolley.**—A trolley employed in an overhead trolley-system.

**Overhead Wires.**—Aerial wires.

**Overland Telegraph.**—Any telegraphic circuit provided with aerial conductors, as distinguished from a submarine or an underground telegraph.

**Overlap Test.**—A localization test for a single fault in a single telegraph line, by observing the resistance from each end and deducting therefrom half of the amount by which the sum of these resistances overlap the total conductor resistance of the line, to determine the position occupied by the fault.

**Overlap Splice.**—A splice of a rope or cable in which the strands of one part overlap the parts of the other, as distinguished from a splice in which the strands of both parts interlace.

**Overlapping Block System.**—An electrically operated block system in which the signals automatically delivered by a train occupying one section, appear at a considerable distance behind the train on the preceding section.

**Overlapping Winding of Alternator Armature.**—A winding in which the successive coils overlap, as distinguished



from a winding in which successive coils are mechanically separated.

**Overload.**—(1) Any load whose value exceeds that of the normal. (2) An excessive load.

**Overload of Electric Motor.**—(1) A load greater than that which an electric motor can carry with its greatest efficiency of operation. (2) Any load which causes injurious heating of a motor. (3) Any load exceeding the full load for which a motor is designed.

**Overload Storage-Battery Switch.**—A switch placed in a discharging circuit of a storage battery, arranged so as to automatically break the circuit of the battery should the discharge become excessive.

**Overload Switch.**—A switch designed to automatically open a circuit upon the occurrence of an overload.

**Over-Load Switch of Accumulator.**—(1) A switch inserted in the circuit of a storage battery which automatically opens or introduces resistance into the circuit when the current becomes excessive. (2) An overload storage-battery switch.

**Overloaded Conductor.**—A conductor carrying any electric current heavier than the normal current for which it was intended.

**Over-Maximal Contraction.**—An increase in the electric stimulation of a motor nerve beyond the point where an apparent maximum stimulus has been reached.

**Over-Running of Incandescent Lamps.**—The operation of incandescent lamps at a pressure above the normal.

**Over-Running Trolley.**—An overhead trolley, as distinguished from an underground trolley.

**"Overshoot."**—To err in compensation by exceeding in adjustment, so as to overpass the limit.

**Overtone Currents.**—Electric currents of harmonic frequencies accompanying a fundamental periodic current.

**Overtones.**—Additional faint tones of higher frequency than the fundamental, and some multiple thereof, associated with the fundamental and tending to give it its characteristic quality.

**Overtones, Electric.**—Electric upper harmonics or rates of alternation higher than the fundamental rate.

**Overtyping Dynamo.**—A dynamo-electric machine whose armature bore or chamber is placed above the field-magnet coils instead of below them.

**Overtyping Magnet.**—A form of horseshoe or polar electro-magnet, standing vertically over the armature between its poles.

**Over-Winding of Series Motor.**—A series motor whose series-field winding is unduly strong.

**Over-Wound Motor Field.**—(1) A motor field so wound that its full strength is nearly attained with considerably less than the normal current. (2) A term sometimes employed for an over-compounded motor field.

**Oyster Fitting.**—A form of incandescent lamp-fitting employed on board a ship for water-tight bulkheads which cannot be pierced.

**Ozite.**—A form of insulating material.

**Ozokerite.**—A form of insulating material.

**Ozone.**—An allotropic modification of oxygen which possesses more powerful oxidizing properties than ordinary oxygen, and formed by electric discharges in air.

**Ozonizer.**—An apparatus for producing ozone by means of electric discharges.

## P

**P.**—A symbol for power.

**P.**—A symbol for electric power.

**P.**—A symbol proposed for pressure.

**Φ.**—A symbol for quantity of magnetic flux.

**P. C.**—A contraction for primary current.

**P. D. or p. d.**—A contraction frequently employed for potential difference.

**P. P. D.**—A contraction for primary potential difference.

**Pacinotti Projections.**—Radial projec-

tions or teeth, in an armature core, so extending from the central shaft as to form slots, pockets or armature chambers, for the reception of the armature coils.

**Pacinotti Ring.**—A ring-shaped armature-core provided with projections employed by Pacinotti to receive the armature windings in his generator.

**Pacinotti Teeth.**—A term sometimes used for Pacinotti projections.

**Packing of Telephone Dust Transmit-**



ter.—The partial cohering of the particles of granulated carbon in a dust transmitter into a solid cake, thus seriously injuring the delicacy of the apparatus.

**Page Effect.**—Faint sounds produced when a piece of iron is rapidly magnetized and demagnetized.

**Palladium.**—A metal of the platinum group.

**Palladium Alloys.**—Various alloys of palladium with other metals, some of which are entirely devoid of paramagnetic properties, and are, therefore, employed for the hair-springs of watches, in order to render them free from the disturbing influence of strong magnetic fields.

**Palette Combination Wire-Gauge.**—A wire-gauge measurer consisting of a graduated cam pivoted in a frame hook, so that the wire to be measured is gripped between the hook and cam.

**Pan-Cake Armature-Coil.**—A flat armature coil applied to and secured upon the surface of an armature.

**Panel Board.**—A switchboard which is not prepared in one piece, but which is constructed and connected in panels.

**Panel Feeder.**—The feeder connected with the bus-bars of any particular panel on a switchboard.

**Panel Fuse.**—A fuse placed in the circuit of a particular panel on a switchboard.

**Panel of Switchboard.**—One of the separate vertical subsections of a composite constructed switchboard.

**Panel Pressure.**—The pressure which is maintained at a particular switchboard panel.

**Panel Reflector.**—A reflector composed of strips or panels of silvered glass, or other good reflecting material.

**Panelled Conductors.**—Conductors placed in mouldings.

**Panelled Wire.**—Wire placed inside mouldings or panels.

**Pan-Telegraphy.**—Fac-simile or automatic telegraphy.

**Pan-Telephone.**—A name proposed for a certain sensitive form of telephone.

**Paper Cable.**—(1) A paper-insulated cable. (2) A cable in which paper is the solid insulator employed.

**Paper Carbons.**—Incandescent lamp filaments formed of carbonized paper.

**Paper Condenser.**—A condenser in which sheets of paper covered by some good insulating material are employed as a dielectric.

**Paper Cut-Out.**—A term sometimes used for film cut-out.

**Paper-Film Cut-Out.**—A paper or film cut-out.

**Paper Insulation.**—Insulation obtained by paper.

**Paper Perforator.**—An apparatus employed in automatic telegraphy for punching in a strip of paper, the circular or elongated spaces that produce the dots and dashes of the Morse alphabet.

**Paper Telephone Cable.**—A paper-insulated telephone cable.

**Parabolic.**—Of or pertaining to a parabola.

**Parabola.**—A conic section formed by the intersection of a right cone by a plane parallel to any side.

**Parabolic Reflector.**—(1) A reflector or mirror the surface of which is a paraboloid, or such as would be obtained by the revolution of a parabola around its axis. (2) A reflector employed in connection with electro-magnetic radiation of which the section perpendicular to the long axis has the form of a parabola, the focus of which is occupied by the electric oscillator.

**Paradox.**—(1) Something which seems to contradict the ordinary laws of nature, but which is in reality the expression of such law. (2) A seeming inconsistency, or self-contradiction.

**Paraffine.**—A solid hydro-carbon possessing high insulating powers.

**Paraffined Wire.**—Wire wrapped or braided with some textile material and afterwards coated with paraffine.

**Paraffining.**—Coating or covering with paraffine.

**Paragrole.**—A French term for a lightning rod, intended to protect a field against the destructive action of hail.

**Parallax.**—The apparent displacement of the position of an object, relatively to points in front or behind it, due to a difference in the point of view.

**Parallax Error.**—An error in reading the position of a pointer on a scale due to parallax.

**Parallel Arc-Circuit.**—A word sometimes used for multiple circuit.

**Parallel Circuit.**—A term sometimes used for multiple circuit.

**Parallel Conical Conductors.**—A system of conical conductors, or of conductors successively diminishing in diameter, employed in parallel distribution.

**Parallel Connected Sources.**—A number of separate sources connected in

parallel, so as to be capable of acting as a single source.

**Parallel-Connected Triphasers.**—Two or more triphasers connected in parallel to a common set of triphase bus-bars or mains.

**Parallel-Connections of Alternators.**—A number of alternators connected to a single pair of leads or bus-bars in parallel or multiple-arc.

**Parallel Coupling.**—A term sometimes employed for the parallel connection of alternators.

**Parallel Distribution.**—A distribution of electric energy in which the receptive devices are arranged between one or more pairs of parallel conductors, extending to the limits of the system.

**Parallel Feeding.**—(1) Furnishing the current required for the operation of a number of receptive devices connected in parallel. (2) Multiple-arc distribution in which a pair of mains is supplied at one end as distinguished from an anti-parallel system.

**Parallel-Series.**—A term sometimes applied to a multiple-series connection.

**Parallel Transformer.**—(1) A transformer connected with a parallel-system of distribution. (2) A transformer that is connected to mains in parallel. (3) A transformer whose secondary coils are connected in parallel.

**Parallel Tree-Circuit.**—A system of parallel distribution in which the distributing means diverge and ramify from a common centre or central station, diminishing in size as they proceed.

**Parallel-Wire Stretcher.** A clamping tool for gripping and stretching wire.

**Parallel-Working of Dynamo-Electric Machines.**—The working of two or more dynamos in parallel.

**Parallelogram of Forces.**—A parallelogram whose sides represent in length and direction the intensity and direction of two co-acting forces, and whose intermediate diagonal represents the resultant force.

**Paramagnet.**—(1) A magnet produced by iron or other magnetic substance. (2) A ferromagnet.

**Paramagnetic.**—(1) Possessing the properties ordinarily recognized as magnetic. (2) Possessing the power of concentrating lines of magnetic force. (3) Ferromagnetic.

**Paramagnetic Permeability.**—Permeability to magnetic force.

**Paramagnetic Polarity.**—Magnetic po-

larity, or the polarity possessed by paramagnetic substances.

**Paramagnetically.**—In a paramagnetic manner.

**Paramagnetism.**—The magnetism of paramagnetic substances.

**Parasitical Currents.**—A name sometimes applied to eddy currents.

**Paratonnere.** A French term for lightning rod, sometimes employed in English technical works.

**Parcel of Wire.**—A word sometimes employed for any quantity of manufactured wire presented at one time and in one piece for examination or testing.

**Parchmentized-Thread Filament.**—A filament for an incandescent lamp made from the carbonization of parchmentized thread.

**Parchmentizing Process.**—A process for converting cellulose thread into artificial parchment by treating it with dilute sulphuric acid.

**Partial Contact.**—(1) A high-resistance or imperfect contact between two telegraphic lines or circuits. (2) An incomplete contact.

**Partial Disconnection.**—(1) A partial discontinuity. (2) A loss of complete metallic connection. (3) An imperfect metallic contact.

**Partial Earth.**—The fault in a telegraphic or other line in which the line is in partial connection with the earth.

**Partial Fault.**—In telegraphy or telephony, a fault due to an imperfect ground-contact, a cross-contact or a disconnection, as distinguished from a complete fault or one that interrupts communication.

**Partial Reaction of Degeneration.**—That form of alteration to electric stimulation in which the nerves show no abnormal reaction to electric stimulation, while the muscles, when directly stimulated by a constant current, exhibit the reaction of degeneration.

**Partial Vacuum.**—An incomplete vacuum.

**Partially Overlapping Winding of Alternator Armature.**—A winding in which some of the coils overlap each other and some of the coils do not overlap.

**Parting of Cable.**—A complete rupture or breaking of a submarine cable.

**Party Lines for Telephone Service.**—(1) Lines which connect several subscribers in one circuit, as opposed to lines

devoted to a single subscriber. (2) Lines connecting permanently together several telephone stations, as distinguished from lines connecting each telephone station through an exchange.

**Parts Gravity Cell.**—A zinc-carbon couple employed with electrolytes of sulphate of magnesia or common salt, and sulpho-chromic salt, in which the liquids are kept apart by their difference of density.

**Passive Resistance.**—A term sometimes used for ohmic resistance.

**Passive State.**—A condition of a metallic substance in which it may be placed in liquids that would ordinarily combine with it, without being attacked or corroded.

**Paste Joint for Lamp Filament.**—A form of joint between the leading-in wires and the ends of the lamp filament obtained by the employment of a moist hydro-carbon paste which is subsequently carbonized.

**Pasted Secondary Cell.**—A secondary cell in which the active material is applied to the surface of the grid or support in the form of a paint, paste, or cement.

**Path of Magnetic Leakage.**—A side path taken by deviating magnetic flux, as distinguished from the main path of usefully employed flux.

**Patrol Alarm-Box.**—In a system of signal telegraphy or telephony, a box from which a call, communication, or alarm can be given by a patrol.

**Paying-Out.**—The operation of passing submarine cable out of the ship while laying it.

**Paying-Out Drum.**—A drum employed in laying a submarine cable and over which the cable takes several turns, whereby, by means of brakes, tension may be applied to the cable as it leaves.

**Paving-Out Leg.**—In a bight of cable at the bows of a cable ship, that side or leg which is paid out, as distinguished from the side or leg which is held stationary or picked up.

**"Pea" Lamp.**—A term sometimes given to a particular form of miniature incandescent lamp.

**Peaked Type of Periodically-Alternating Electromotive Force.**—A type of electromotive force whose curve of graphical representation has a peaked shape, as opposed to a smooth or a flat shape.

**Pear Push.**—A pear-shaped push-contact,

usually provided with a flexible cord pendant.

**Pedestal of Armature.**—A supporting pillar for an armature bearing.

**Peg-Circuit.**—A circuit that is opened or closed by means of metallic pegs.

**Peg-Switch.**—(1) A switch that is opened or closed by means of a peg. (2) A pin switch.

**Peg-Switchboard.**—A switchboard whose circuits are capable of being variously inter-connected by means of peg switches.

**Peltier Effect.**—The heating effect produced by the passage of an electric current across a thermo-electric junction, or surface of contact between two different metals, as distinguished from a Joule effect or heat due to resistance merely.

**Peltier's Cross.**—A cross, made by placing two plates of dissimilar metals in contact at right-angles to each other, employed for the study of the Peltier effect.

**Pen Carriage.**—The carriage in an electric chronograph which carries the pen and moves over the sheet of paper on which the record is made.

**Pen, Electric.** A device for manifold copying, in which a sheet of paper is made into a stencil by minute perforations obtained from a needle driven by a small electric motor, the stencil being afterwards employed in connection with an ink roller for the production of any required number of copies.

**Pencil Microphone.**—A carbon microphone in which the loose carbon is in the form of one or more pencils.

**Pendant Argand.**—An Argand burner so arranged as to be lighted or extinguished by the pulling of a pendant.

**Pendant Cord.**—A flexible conductor provided for conveying the current to a pendant lamp or push.

**Pendant, Electric.**—A hanging fixture provided with a socket for the support either of an incandescent lamp, or of a contact.

**Pendant Electric-Lamp.**—An incandescent lamp supported on a pendant cord.

**Pendant Pull-Switch.**—A switch which is operated by pulling upon a pendant cord or loop.

**Pendant Socket.**—An attachment provided with a chain or chains for turning on or off a lamp not readily accessible.

**Pendulum Annunciator.**—(1) An annunciator whose indicating arm consists of a pendulous or swinging arm which, when at rest, assumes a vertical position,



and which is moved to the right or left by the action of the current. (2) A swinging annunciator.

**Pendulum, Electric.**—(1) A pendulum so arranged that its to-and-fro motions send electric impulses over a line, either by making or breaking contacts. (2) An electric tuning fork whose to-and-fro movements are maintained by electric impulses.

**Pendulum Indicator.**—A term sometimes employed for a pendulum annunciator.

**Pendulum Myograph.**—An electric pendulum employed for physiological and chronographic purposes.

**Pendulum Selector.**—In a system of selective telephony, a pendulum which is adjusted to vibrate at different rates and thereby actuate the call-bell of some particular station selectively.

**Pendulum Signaller.**—A pendulum armed with a contact maker for closing a circuit and transmitting signals.

**Pentad Atom.**—An atom whose valency or atomicity is five.

**Pentane Standard.**—A standard source of light obtained from the burning of pentane, and used in photometric measurements in place of a Methven screen.

**Penthode Working.**—A five-way mode of telegraphic working obtained by the use of the Delany synchronous multiplex telegraph.

**Penumbra.**—A region of partial shadow surrounding the umbra or complete shadow, obtained when the source of light causing the shadow has an appreciable area.

**Percentage Conductivity.**—The conductivity of a wire expressed in percentage of the conductivity of Matthiessen's standard.

**Percentage Conductivity of Wire.**—(1) The conductivity of a wire in terms of the conductivity of pure copper. (2) The conductivity of a particular copper wire compared with the conductivity of a standard wire of the same dimensions. (3) The conductivity of a wire referred to Matthiessen's standard of conductivity for copper.

**Perfect Linkage.**—Linkage of magnetic flux between two associated coils or circuits unaccompanied by magnetic leakage, or such that all of the flux is linked with all the turns of each circuit.

**Perforated Armature.**—An armature provided with perforations for the insertion of the coils.

**Perforated Core-Discs.**—The separate core-discs of a laminated armature core provided with perforations for the insertion of armature wires.

**Perforator.**—(1) A paper perforator. (2) In automatic telegraphy, an apparatus for perforating paper.

**Perforator Mallet.**—A mallet used with a perforator for striking its keys.

**Perforator Slip.**—The slip of paper prepared for use in a perforator.

**Period.**—(1) The interval of time between two successive passages of a vibration through a given point of its path taken in the same direction. (2) The time occupied in performing a complete cycle.

**Period of Open-Circuit Oscillation.**—The time in which the oscillation set up in an open circuit by electric resonance requires to make one complete to-and-fro motion.

**Period of Simple-Harmonic Motion.**—The interval of time which elapses between two successive passages of a moving particle over the same point in the same direction.

**Period of Vibration.**—The time occupied in executing one complete vibration or motion to-and-fro.

**Periodic.**—Of or pertaining to a period.

**Periodic Alternating Electromotive Force.**—An electromotive force whose direction periodically varies.

**Periodic Current.**—(1) A current whose strength and direction periodically vary. (2) A simple harmonic or sinusoidal current. (3) A periodically alternating current.

**Periodic Discharge.**—(1) An electric discharge which periodically changes its direction. (2) An alternating discharge.

**Periodic Governor.**—A form of governor for an electric motor, in which the current is automatically cut off for a certain portion of each revolution.

**Periodic Motion.**—A term sometimes employed for simple-periodic motion.

**Periodically Alternating Discharge.**—An alternating discharge.

**Periodically Decreasing Discharge.**—An oscillatory discharge whose successive oscillations decrease in intensity.

**Periodicity.**—(1) The number of periods executed per second by a periodically alternating quantity. (2) The number of cycles executed in unit time by an alternating current. (3) The frequency of an alternating current.

**Periodicity of Alternation.**—(1) The



number of alternations per second. (2) The frequency. (3) The number of alternations executed per second or per minute.

**Periodicity of Auroras, Magnetic Storms, and Sunspots.**—Coincidences between the occurrence of auroras, magnetic storms and sun-spots.

**Peripheral Speed.**—The speed of a point on the circumference of a rotating cylinder or wheel.

**Peripheral Velocity.**—(1) The rate of linear peripheral speed. (2) The tangential velocity at a periphery.

**Periphratic Region.**—A region which encloses other regions within itself.

**Peripolar Zone.**—The zone or region surrounding the polar zone on the body of a patient undergoing electro-therapeutic treatment.

**Periscopic Eye-Piece of Microscope.**—An eye-piece consisting of a triple eyelen and a single field-lens, possessing a very large and flat field.

**Permanency, Electric.**—The property possessed by most metallic substances, while in a solid state, of retaining a constant electric conducting power at the same temperature.

**Permanent Charge by Induction.**—An induced charge permanently communicated to a conductor, as distinguished from a temporarily induced charge.

**Permanent Currents of Wheatstone System.**—(1) In the Wheatstone automatic system the use of a signalling current during the whole period in which a signal is transmitted. (2) The continued application of current in one or other direction on the line.

**Permanent Current Telephone Working.**—A system of telephony employing a constant normal strength of current on the line.

**Permanent Electret.**—A body whose molecules are permanently and inherently electrized, as distinguished from a body whose molecules are only inherently electrized while under the influence of some change of state.

**Permanent Intensity of Magnetization.**—A term employed for the intensity of a permanent magnetism produced in hard steel, as distinguished from the magnetization produced temporarily in soft iron.

**Permanent Laminated Magnet.**—A term sometimes employed in place of compound-magnet.

**Permanent Magnet.**—A name sometimes

given to a magnet composed of hardened steel, whose magnetic retentivity is high.

**Permanent-Magnet Voltmeter.**—A form of voltmeter in which difference of potential is measured by the movement of a magnetic needle under the combined action of a coil and a permanent magnet, against the pull of a spring.

**Permanent Magnetism.**—Magnetism possessed by permanent magnets.

**Permanent Magnetization.**—(1) A term employed for the magnetization produced in a mass of steel or hardened iron when brought into a magnetic field. (2) The magnetization of a permanent magnet.

**Permanent Magneto-Motive Force.**—The magneto-motive force of a permanent magnet.

**Permanent State of Charge on Telegraphic Line.**—(1) The condition of the charge on a telegraphic line during the time the current passing is at full strength in all parts. (2) The charge in a telegraph line when insulated at one end and connected to an E. M. F. at the other.

**Permanent System of Currents.**—(1) A term sometimes used in telegraphy to represent the current sent into a line by a double-current key. (2) In a Wheatstone's automatic telegraph system the use of double currents, whereby a current is always flowing on the line.

**Permanent Telegraphic Line.**—A term employed for a telegraphic line that is intended to remain in use for an indefinite time, in contra distinction to a semi-permanent line which is only designed for use during a comparatively limited time.

**Permanent Telegraphic Signals.**—Telegraphic signals that are permanently recorded as distinguished from transient or unrecorded signals.

**Permeability Bridge.**—A device for measuring the magnetic permeability of a medium, operating on the principle of a Wheatstone bridge.

**Permeability Curve.**—A curve representing the permeability of a magnetic substance.

**Permeameter.**—An apparatus for determining magnetic permeabilities by the measurement of the tractive force required to detach a mass of soft iron having a plane surface, from a magnetic pole whose magnetic flux passes perpendicularly through the surface.

**Permeance, Magnetic.**—(1) The reciprocal of magnetic reluctance. (2) The conductance of a medium to magnetic flux.

**Permeating.**—(1) The passage of mag

netic flux through a magnetizable substance, or of electrostatic flux through a dielectric. (2) Intimately traversing the depths of a medium.

**Permeation.**—The passage of magnetic flux through any permeable substance.

**Permissive Block-System for Railroads.**—A block-system in which two or more trains are, under certain conditions, permitted to occupy the same block simultaneously.

**Permissivity.**—A word frequently used for permittivity.

**Permittance.**—(1) Electrostatic capacity. (2) The capability of a condenser or dielectric to hold a charge.

**Permittivity.**—(1) Specific permittance. (2) The dielectric constant.

**Perpendicular.**—(1) At right angles to. (2) A line at right angles to one or more other lines.

**Persistence of Energy.**—The indestructibility of energy.

**Personal Equation.**—A constant observational error peculiar to an observer, and depending upon his psychological condition.

**Perviability.**—A word proposed for permeability to electrostatic flux.

**Perviance.** (1) Conductance to electric lines of force. (2) The reciprocal of diviance.

**Petticoat Insulator.**—(1) An insulator provided with a petticoat, or deep internal groove, around its lower extremity, or stalk. (2) A line-wire vertical insulator provided with an insulating inverted cup having a form resembling a petticoat. (3) An ordinary telegraph or telephone single-cup insulator.

**Pflügers Law.**—A given tract of nerve is stimulated by the appearance of cathelectrotonus and the disappearance of anelectrotonus, but not by the disappearance of cathelectrotonus and the appearance of anelectrotonus.

**Phantom Circuit.**—(1) Any of the additional circuits established on a telegraphic line by means of any variety of multiplex telegraphy. (2) An imaginary current virtually created by multiplexing a telegraph circuit.

**Phantom Streams.**—A term sometimes applied to a variety of the Tesla streaming discharge.

**Phantom Wires.**—(1) A term sometimes applied to the virtual additional circuits or wires obtained in any single wire or conductor by the use of any multiplex

telegraphic system. (2) Phantom circuits.

**Phase.**—The fractional part of a period, which has elapsed since a vibrating body last passed through the extreme point of its path in the positive direction.

**Phase Angle.**—The angle of phase, in a simple-harmonic motion, or the angular distance through which the corresponding circularly moving point has passed from the point of last maximum positive elongation.

**Phase Detector.**—A device for determining the phase of an alternating current, electromotive force, or flux.

**Phase Diagram.**—A diagram representing the magnitude and relative phase position of electric pressures or currents.

**Phase-Difference Measurer.**—A device for measuring difference of phase, between any periodically alternating quantities.

**Phase Indicator.**—(1) A device for indicating when the pressure of an alternator is in phase and synchronism with the pressure of the circuit with which it is to be connected. (2) A term sometimes employed for a synchronizer.

**Phase Meter.**—A phase-difference measurer.

**Phase Modification.**—The alteration of the phase of any periodically alternating quantity.

**Phase of Simple-Harmonic Motion.**—The angle through which the corresponding circularly moving point has moved from the point of maximum positive elongation.

**Phase of Vibration.**—(1) The position of the particles in motion in a wave or vibration at any instant of time during the wave period, as compared with their mean position. (2) The phase angle of vibration considered as simple-harmonic motion.

**Phase Regulation.**—The regulation of the phase or phases of alternating currents or E. M. F.'s.

**Phase-Splitter.**—(1) Any apparatus which so acts upon an incoming alternating current that the same current goes out in different branches as a plurality of currents differing in phase. (2) A device for producing a difference of phase between two currents, so as to enable a single-phase induction-motor to be self-starting. (3) A device for making an alternating current split into two or more dephased components.

**Phase Splitting.**—The quality or opera-

tion of causing a single alternating current to split into a plurality of relatively dephased components.

**Phase Transformation.**—A change of phase obtained by a transformer whereby two-phase currents may be transformed into three-phase currents, or vice-versa.

**Phase-Windings.**—The separate windings on the armature of a polyphase motor.

**Phasing Current.**—The current produced between two dynamos when thrown into parallel, which arises from their being either not perfectly in phase, or not perfectly equal in pressure, or both.

**Phasing or Wattless-Component.**—A component of alternating current,  $90^\circ$  out of phase with respect to a pressure, and, therefore, indifferent to it in respect to energy.

**Phasing Transformer.**—(1) A transformer capable of effecting a change of phase. (2) A transformer for the supply of multiphase secondary-currents from uniphase primary-currents, or, vice-versa.

**Phelp's Stock Printer.**—A form of printing telegraph employed in sending stock quotations telegraphically.

**Phenakistoscope.**—An optical toy depending on the persistence of a retinal image, in which the appearance of life is obtained from a succession of suitable pictures that are caused to rapidly pass before the eye.

**Phenomenon.**—Any event observed or known to occur in nature.

**Pherops.**—A name sometimes applied to a telephoto.

**Philosopher's Egg.**—A name given to the ovoid or egg-shaped mass of light, that appears when a convective discharge is taken between two electrodes in a partial vacuum.

**Phonautograph.**—An apparatus for the automatic production of the visible tracings of the vibrations produced by any sounds.

**Phone.**—(1) A contraction frequently employed for telephone. (2) A message sent by telephone.

**Phone.**—To send a message by telephone.

**Phoned.**—Communicated by telephone.

**Phonic Wheel.**—A wheel maintained in synchronous rotation by timed electric impulses sent over a telegraphic line, and employed in the Delany synchronous multiplex telegraph system.

**Phoning.**—Communicating by telephone.

**Phonogram.**—A term proposed for a de-

spatch transmitted by means of a telephone.

**Phonograph.**—An apparatus for the recording and reproduction of articulate speech, or of sounds of any character, at any time after their occurrence, and for a number of times.

**Phonograph Record.**—A record obtained by means of a phonograph.

**Phonographic.**—Of or pertaining to the phonograph.

**Phonophore.**—A modified form of harmonic telegraph.

**Phonoplex.**—A general term embracing the apparatus employed in phonoplex telegraphy.

**Phonoplex Telegraphic-Receiver.**—A special form of telephone receiver employed in phonoplex telegraphy, which responds to brief current impulses but not to prolonged impulses.

**Phonoplex Telegraphy.**—A system of double telegraphic transmission, in which telephonic currents, superposed on the ordinary Morse currents, actuate a modified telephonic receiver, and thus permit the simultaneous transmission of two separate messages over a single wire without interference.

**Phonoplex Transmission.**—Double telegraphic transmission obtained by the superposition of telephonic and Morse currents.

**Phonozonograph.**—An instrument devised to indicate the direction of a distant sound.

**Phosphoresce.**—To emit phosphorescent light.

**Phosphorescence.**—The power of emitting light, or becoming luminous by simple exposure to radiant energy.

**Phosphorescence, Electric.**—Phosphorescence caused in a substance by the passage of an electric discharge.

**Phosphorescent.**—Possessing the quality of phosphorescence.

**Phosphorescent Glow.**—A phosphorescent light emitted by the residual atmosphere of a vacuum tube several seconds after an electric discharge has ceased to pass through it.

**Phosphorescent Lamp.**—A lamp whose light is obtained by means of the phosphorescent effects attending electrical discharges through a rarified space.

**Phosphorescing.**—Emitting phosphorescent light.

**Phosphoroscope.**—An apparatus for



measuring the phosphorescent power of any substance.

**Phot.**—(1) A unit of time-illumination, or the total illumination produced by one lux for one second of time. (2) The lux-second.

**Photo-Chemical.**—Relating to photo-chemistry.

**Photo-Chemical Effect.**—Chemical effects produced by the action of radiant energy.

**Photo-Chemistry.**—The chemistry of the effects of radiant energy.

**Photo-Chronograph.**—An electric instrument for automatically recording the transit of a star across the meridian.

**Photo-Electric.**—Pertaining to the combined action of light and electricity.

**Photo-Electric Alarm.**—(1) An alarm operated by means of a photo-electric cell. (2) A selenium cell proposed for use in connection with the circuit of an electric source and suitable electro-receptive devices, so as to cause the sounding of an alarm on the exposure of one of the faces of the cell to light.

**Photo-Electric Battery.**—Several photo-electric cells so combined as to be capable of acting as a single source.

**Photo-Electric Cell.**—A cell capable of producing difference of potential when its opposite faces are unequally exposed to radiant energy.

**Photo-Electric Impulsion-Cell.**—A photo-electric cell whose sensitiveness to light may be restored by slight impulses, such as mechanical blows or taps, or by electro-magnetic impulses.

**Photo-Electricity.**—Difference of electric potential produced by the action of light.

**Photo-Electromotive Force.**—An electromotive force produced by the action of light.

**Photo-Engraving.**—Engraving effected by the agency of light.

**Photo-Fluoroscopy.**—The photography of the image obtained on a fluoroscopic screen.

**Photographic Meter.**—An electric meter producing a photographic record.

**Photographic Negative.**—A photographic picture whose lights and shadows are reversed with reference to the original.

**Photographic Positive.**—A photographic picture whose lights and shadows correspond to those in the natural object.

**Photometer.**—An apparatus for measuring the intensity of the light emitted by any luminous source.

**Photometer Bar.**—A graduated horizontal bar designed to carry a photometer screen and to indicate by the distance of the screen from the sources of light, the relative intensities of the lights compared.

**Photometer Bench.**—A photometer bar, with or without accessory photometric apparatus.

**Photometer Box.**—A darkened box in which is placed the photometer screen or disc.

**Photometer Disc.**—The photometer screen.

**Photometer, Electric.**—An electric instrument for measuring the intensity of light or illumination.

**Photometer Gallery.**—A name sometimes given to a photometric bench.

**Photometer Screen.**—An opaque or translucent screen, employed in a photometer for measuring the intensity of light, and which receives the two illuminations to be compared.

**Photometric.**—Of or pertaining to a photometer.

**Photometric-Surface of Luminous Source.**—A surface formed by the locus of points at the ends of lines, obtained by laying off lines in various directions passing through the luminous source, whose lengths measure the intensity of the rays emitted in these directions.

**Photometrically.**—In a photometric manner.

**Photo-Micrography.**—The photography of microscopic objects.

**Photo-Micrography, Electric.**—The art of photographing microscopic images by means of the electric light.

**Photophone.**—An instrument for the telephonic transmission of articulate speech along a ray of light instead of along a conducting wire.

**Photophone Transmitter.**—The transmitter employed in radiophony, in connection with the photophone.

**Photophore.**—An apparatus in which the light of a small incandescent lamp is employed for purposes of medical exploration.

**Photosphere.**—The luminous envelope which surrounds the sun, and which is the source of its luminous radiation.

**Photo-Telegraphy.**—(1) Telegraphic communication carried on by means of light. (2) Heliography. (3) Radiophony.

**Photo-Voltaic Cell.**—A photo-electric cell.



**Photo-Voltaic Effect.**—A change in the resistance of selenium or other substance produced by its exposure to light.

**Physical Change.**—Any change in matter resulting from a re-arrangement of its molecular groupings, without the formation of new molecules, as distinguished from a chemical change.

**Physical Equator.**—The geographical equator.

**Physical Phosphorescence.**—Phosphorescence produced in matter by the impact of light waves, resulting in a vibratory motion of the molecules, of a rapidity sufficient to cause them to emit light.

**Physical.**—(1) Of or pertaining to nature. (2) Natural.

**Physiological.**—Of or pertaining to physiology.

**Physiological Coefficient of Illumination.**—The illuminating value of one watt of activity at frequencies within visible limits of the spectrum.

**Physiological Rheoscope.**—A sensitive nerve-muscle preparation employed to determine the presence of an electric current.

**Physiologically.**—In a physiological manner.

**Physiologically-Effective Flux of Light.**—The physiologically-effective illumination received by any surface.

**Physiologically-Effective Radiation.** That portion of the radiation which consists of physiologically active or luminous frequencies.

**Physiology, Electro.**—The study of the electric phenomena of living animals and plants.

**Piano, Electric.**—A piano whose strings are struck by hammers actuated by means of electro-magnets.

**Picking-Up Gear.**—The gear provided in a cable ship for the recovery of a submerged cable.

**Pickle.**—An acid solution in which metallic objects are dipped in order to thoroughly cleanse their surfaces before being electro-plated.

**Piece of Wire.**—A single length of wire without a joint or splice of any description.

**Pierced-Core Armature.**—A perforated armature core.

**Piezoelectricity.**—Electrification produced in certain crystalline substances by pressure.

**Piezometer.**—An apparatus for determining the compressibility of a liquid.

**Pike Pole.**—A straight pole armed at one end with a metal point or pike, for use in setting up telegraph poles.

**Pile.**—(1) A word frequently used for voltaic or thermo-electric pile, though more frequently for the former. (2) A voltaic or thermo-electric battery.

**Pilot Brush.**—A small accessory brush placed on the commutator cylinder for the purpose of determining the variations in the electromotive force produced in various segments.

**Pilot-House Controlling-Gear.**—Gear placed in the pilot house for the control of a search-light projector.

**Pilot Lamp.**—(1) A lamp connected across the terminals of a dynamo to show roughly the pressure which it is producing. (2) A lamp placed in a central station, generally on the dynamo itself, to indicate the difference of potential at the dynamo terminals by means of the intensity of the emitted light.

**Pilot Motor.**—(1) A small motor which goes ahead of and serves to set in operation a larger or working motor. (2) A small motor whose sole duty is to actuate contacts for controlling the operation of a large motor.

**Pilot Transformer.**—A small transformer placed at any desired portion of a line in order to determine its pressure.

**Pilot Wires.**—(1) The wires leading directly to the generating station from different parts of the mains, in order to determine the difference of potential at such parts. (2) Wires provided for connection to a pilot lamp, or other device for indicating the maintenance of normal pressure.

**Pins.**—Wooden pegs for supporting pole line insulators.

**Pin Plug.**—A plug consisting of a single metallic pin with or without an insulating head, for bridging a discontinuity in a resistance box or switchboard.

**Pipe Conduit.**—A conduit formed of suitably prepared metallic pipes surrounded either on the interior or the exterior with a cementing compound.

**Pipe Pole.**—(1) A pole for aerial wires, formed of iron pipes, usually in lengths or sections of tapering diameter. (2) A pole of iron or steel in tubular form.

**Pipette.**—A glass tube suitable for holding and removing small quantities of liquid for analytical or other purposes.

**Piston Manometer.**—A manometer whose operation is dependent on the principle of hydraulic pressure.

**Pitch.**—(1) The frequency of vibration of a musical tone. (2) The frequency of an electrically produced tone. (3) The distance between successive corresponding points of symmetry in a mechanical system, such as of screw threads or propeller blades. (4) The distance between successive corresponding conductors on a dynamo armature. (5) In an armature winding divided into coils or segments, the number of coils through which advance must be made in making end connections between the coils.

**Pitch Line.**—(1) A circle upon the periphery of which the pitch is measured. (2) A circle drawn around the external surface of an armature through the middle of the length of the inductors placed thereon.

**Pitch of Poles.**—The distance measured along the pitch line between the centres either of a pair of poles of opposite sign, or of a pair of poles of the same sign.

**Pitch of Windings.**—(1) In alternators, usually the distance measured along the pitch line between the centres of a pair of successive poles of opposite sign; or, in some alternators, half this distance. (2) In a continuous-current armature, the pitch.

**Pitch-Ratio of Alternator.**—The ratio of the width of a pole-piece, or an armature coil, to the pitch of the machine, or distance between successive field-pole centres as measured on the pitch line.

**Pith.**—A light cellular substance that forms the central portions of the stalks of certain plants.

**Pith Balls.**—Two balls of pith, suspended from an insulated conductor by conducting threads of cotton, or other semi-conducting substance, and employed for showing the presence of a charge on the same by their mutual repulsion.

**Pith-Ball Electroscope.**—An electroscope whose indications are obtained by the attractions or repulsions of pith balls.

**Pivot Suspension.**—Suspension of a needle by means of a jewelled cup and a metallic pivot.

**Pivotal Trolley.**—A trolley stand in which the pole is supported on a pivot, so as to be capable of rotation, for the purpose of reversing the direction.

**Plain-Pendant Argand Electric Burner.**—A plain-pendant electric burner suitable for lighting an Argand gas burner.

**Plain-Pendant Electric Burner.**—A gas burner provided with a pendant for the

purpose of lighting the gas by means of a spark, after the gas has been turned on by hand.

**Plaited Electrode Accumulator.**—A form of storage cell or accumulator, in which the electrodes consist of plaited strips or ribbons of lead.

**Plane Angle.**—(1) An angle contained between two straight lines. (2) An angle lying in a plane.

**Plane of Polarization of Light.**—(1) The plane of incidence in a ray of light polarized by reflection. (2) A plane perpendicular to the plane of vibration of plane polarized light.

**Plane Vector.**—A quantity which possesses not only magnitude but also direction in a single plane.

**Planimeter.**—An instrument for automatically integrating the areas of plane curves, around the contour of which a fiducial point on the instrument is carried.

**Plano-Concave.**—Flat on one side and concave on the other.

**Plano-Convex.**—Flat on one side and convex on the other.

**Plant.**—An installation.

**Plant Efficiency.**—(1) The efficiency of a plant or electric installation. (2) The efficiency of a plant as distinguished from the distribution system which it operates, or by which it may be operated.

**Plant Efficiency of Motor.**—The efficiency of a motor, as distinguished from the efficiency of the system with which it is connected.

**Plant Electricity.**—Electricity produced by plants during their growth.

**Plastic.**—Possessing the property of plasticity.

**Plastic-Circuit Microphone.**—A microphone which operates by varying the resistance of a plastic circuit.

**Plastic Rail-Bond.**—In street-railway systems, a rail bond in which contact is secured with the rail-ends by sodium amalgam, or other conducting material applied in a plastic condition.

**Plasticity.**—(1) The property of readily changing form under continuous stress. (2) The property of possessing small resistance to distortional stress.

**Plate Condenser.**—(1) A condenser, the metallic coatings of which are placed on suitably supported dielectric plates. (2) A condenser made up of one or more pairs of conducting plates separated by a plate or plates of non-conducting material.

**Plated.**—Electro-plated, or covered with an electro metallurgical coating.

**Platform Controller.**—An electrical car-controller placed on the platform of a car for the purpose of starting, stopping and regulating the speed of the car.

**Platform Coupling.**—An electric coupling connecting two cars and placed on or beneath the platform of the cars.

**Platinating.**—Covering a conducting surface electrolytically with platinum.

**Plating.**—A word frequently used for electro-plating.

**Plating Balance.**—An automatic device for disconnecting the current from an article to be plated, as soon as a certain increase in weight has been reached.

**Plating Dynamo.**—A dynamo employed for furnishing the current required for a plating process.

**Plating Trough.**—A term sometimes employed for plating bath.

**Platinoid.**—An alloy consisting of German silver with one or two per cent. of metal-hungsten, whose electric resistivity is only slightly affected by changes of temperature.

**Platinum.**—A heavy, refractory and not readily oxidizable metal of a tin-white color.

**Platinum Alloy.**—An alloy of platinum, commonly a platinum-silver alloy.

**Platinum Black.**—Finely divided platinum that possesses in a marked degree the power of absorbing or occluding gases.

**Platinum Fuse.**—A thin platinum wire rendered incandescent by the passage of an electric current, and employed for the ignition of a charge of powder.

**Platinum-Iridium Alloy.**—An alloy of platinum and iridium employed for the manufacture of wire sometimes used in resistance coils on account of its low temperature coefficient of resistivity.

**Platinum Lamp.**—(1) A lamp whose incandescent filament is formed of a platinum wire. (2) A lamp of molten platinum. (3) A Violle.

**Platinum-Silver Alloy.**—A name usually applied to a particular alloy of one part of platinum and two parts of silver, possessing a low temperature-coefficient of resistivity.

**Platinum Standard Light.**—(1) The luminous intensity emitted perpendicularly by a surface of platinum one square centimetre in area, at its temperature of fusion. (2) The Violle standard.

**Platinum Sulphuric Acid Voltameter.**—A platinum voltameter.

**Platinum Voltameter.**—(1) A voltameter employing platinum electrodes. (2) A voltameter furnished with platinum electrodes immersed in a dilute solution of sulphuric acid and water.

**Platinizing.**—(1) Covering a surface electrolytically with platinum. (2) Platinum plating, or, electro-plating with platinum.

**Platinizing.**—(1) Obtaining a platinum coating of a conducting surface by simple immersion in a solution of a platinum salt. (2) Plating.

**Platymeter.**—An instrument employed for comparing the capacity of two condensers, or the specific inductive capacities of two dielectrics.

**Plow.**—A term sometimes employed for the sliding contact and its support that is pushed before a car, along the trolley conductors in an underground trolley system.

**Plow, Electric.**—An electrically propelled plow employed in agriculture.

**Plucker Tube.**—A modification of a Geissler tube employed for studying the stratification of the light, and the peculiarities of the space adjoining the negative electrode.

**Plug.**—(1) A suitably shaped metallic key provided with an insulating handle and employed for closing or making contacts. (2) An incompetent telegraph operator.

**Plug Cut-Out.**—A cut-out employing fuse-plugs.

**Plug Hole.**—The hole provided in a plug switch for the introduction of a plug.

**Plug Key.**—A key-shaped plug.

**Plug Operator.**—A term of contempt sometimes applied to an inefficient telegraphic operator.

**Plug Resistances.**—(1) A number of separate resistances that can be introduced into a circuit by unplugging. (2) The resistances of the ordinary resistance box.

**Plug Sleeve.**—The contact cylinder on the surface of a telephone-switchboard plug.

**Plug Switch.**—A switch operated by the insertion of a metallic plug between two insulated metallic segments connected to a circuit, and separated by air-spaces for the reception of the plug key.

**Plug Switchboard.**—A switchboard whose various circuits are inter-connected by means of plug keys.

**Plugging.**—(1) Completing a circuit by



means of plugs. (2) In a telephone switchboard, the operation of making the connections by inserting plugs in the proper jacks.

**Plumbago.**—(1) An allotropic modification of carbon. (2) Graphite.

**Plunge Battery.**—The couples of a voltaic battery so supported on a horizontal bar as to be capable of being simultaneously placed in or removed from the exciting liquid.

**Plunger Door-Contact.**—A form of electric contact for doors in which the closing of the door forces in a small plunger against the tension of a spring, thereby either making or breaking an electric alarm circuit.

**Plunger Floor-Contact.**—A form of plunger contact suitable for being placed on the floor and operated by the foot.

**Plunger Switch.**—A switch, the operating lever cylinder of which passes through a bushing in a switchboard, so as to make and break contacts at the back of the switchboard.

**Plus Charge.**—A positive charge.

**Pneumatic.**—Of or pertaining to pneumatics.

**Pneumatic Car-Brake Mechanism.**—A car-brake operated by air-pressure.

**Pneumatic Perforator.**—A paper perforator operated by compressed air.

**Pneumatic Rodding.**—A method of introducing a cable or wire into the duct of a conduit by the movement of a dart driven through the duct by air pressure.

**Pneumatic Telegraph.**—A form of instrument for transmitting signals by means of air pressure.

**Pneumatic Transmission.**—Transmission of objects or of power, effected by means of compressed air.

**Pneumatics.**—That branch of physics which treats of the properties of gases either at rest or in motion.

**Pocket Galvanometer.**—A galvanometer suitable for carrying in the pocket.

**Pocket Gauge, Electric.**—A rough form of pocket galvanometer.

**Pocket Telegraphic-Relay.**—A relay sufficiently small to be readily carried in the pocket.

**Pockets in Inside Wiring System.**—Hollow spaces provided in the walls, floors or ceilings of a building for drawing wires in, for making connections, or for inserting safety devices.

**Poggendorff's Voltaic Cell.**—The name sometimes given to the Grenet cell.

**Point Discharge.**—A term sometimes applied to a convective discharge.

**Point of Origin.**—(1) In graphics, the point where the axes of co-ordinates start. (2) The point at which a curve starts.

**Points on Lightning Rod.**—Points of unoxidizable metal placed on lightning rods to effect the quiet discharge of a cloud by convection streams.

**Points of Compass.**—(1) The thirty-two points into which the edge or periphery of a compass card is divided. (2) The rhumbs of a compass.

**Polar.**—Of or pertaining to a pole.

**Pointer Telegraph.**—A term sometimes used for a dial telegraph.

**Polar Aurora.**—A general term for the Northern or Southern light.

**Polar Bore of Field Frame.**—The bore or cylindrical hollow space excavated in a field frame for the reception of an armature.

**Polar Duplex.**—A system of differential duplex-telegraphy employing polar-receiving relays.

**Polar Duplex-Telegraphy.**—Telegraphic communication obtained by means of a differential duplex in which the current flowing from the home battery to line is reversed when the home key is depressed.

**Polar Electrolysis.**—(1) A form of electrolysis attended by destruction of the tissues. (2) Galvano-Cauteries.

**Polar Relay.**—In telegraphy, a relay having a normally polarized armature, as distinguished from a neutral relay, in which the armature is normally in neutral magnetic condition.

**Polar Surface of Magnet.**—(1) The surfaces of one or both poles of a magnet. (2) A surface of magnetic material from which or into which magnetic flux passes.

**Polar Tips.**—The free ends of the field-magnet pole-pieces of a dynamo-electric machine.

**Polar Transformer.**—A term sometimes employed for an open-circuit transformer.

**Polar Variation Diagram.**—A diagram drawn to polar co-ordinates and representing some relation between periodically varying quantities.

**Polar Zone.**—The zone or region in the human body surrounding a therapeutic electrode.

**Polariscope, Electric.**—An electric apparatus for polarizing electro-magnetic waves and for revealing the presence of polarization.



**Polarity.**—(1) The possession of poles, or of opposite properties, at opposite ends. (2) The condition of electric or magnetic differentiation between properties of electric or magnetic flux depending on and inherent in the direction of such flux.

**Polarity Indicator.**—Any device for determining the direction of a current or the polarity of a magnet.

**Polarization Battery.**—A term sometimes employed for a secondary or storage battery.

**Polarization Current.**—In electro-therapeutics the constant current which, when passed through a nerve, produces therein the electro-tonic state.

**Polarization Current from Fault in Cable.**—A current due to the polarization of a fault or break in a cable under the action of a testing current.

**Polarization, Electric.**—(1) In dielectrics, the condition of being subjected to electrification. (2) In dielectrics, the condition of containing or restoring a residual charge. (3) In electrolysis, the condition of having free ions liberated at the electrodes, whereby a C. E. M. F. is set up.

**Polarization Fault-Current of Cable.**—A current produced in a cable due to the counter-electromotive force set up in a fault under the action of a signalling, testing, or natural current.

**Polarization of Dielectric.**—(1) A molecular strain produced in the dielectric of a Leyden jar, or other condenser, by the attraction of the electric charges on its opposite faces, or by electrostatic stress. (2) A term sometimes employed for electric displacement.

**Polarization of Electrolyte.**—An assumed formation of molecular groups or chains in which the poles of all the molecules of any chain are turned in the same direction, that is with their positive poles facing the negative plate, and their negative poles facing the positive plate.

**Polarization of Light.**—The condition of a ray of light in which the vibrations of the ether by which the light is propagated are all limited to a single plane, the plane perpendicular to which is called the plane of polarization.

**Polarization of Voltaic Cell.**—The collection of a gas, generally hydrogen, on the surface of the negative element of a voltaic cell.

**Polarization Battery.**—A term sometimes used for secondary or storage battery.

**Polarisation Photometer.**—A photo-

meter in which the illumination of the stronger of two luminous sources to be compared is reduced by polarization.

**Polarized Armature.**—An armature which possesses a polarity independently of that imparted by the working current.

**Polarized Bell.**—An electro-magnetic bell provided with a polarized armature.

**Polarized Indicator.**—Any electro-magnetic indicator employing a polarized armature.

**Polarized Ink-Recorder.**—An ink-recorder employing a polarized armature.

**Polarized Radiation.**—Any radiation whose waves are polarized, or restricted to a particular plane of vibration.

**Polarized Relay.**—(1) A telegraphic relay provided with a permanently magnetized armature in place of the ordinary soft-iron armature. (2) A polar relay. (3) A non-polarized or neutral relay, as distinguished from a polarized relay.

**Polarized Ring-Off Drop.**—A ring-off drop in a telephone switchboard having a polarized armature.

**Polarized Sounder.**—A telegraphic sounder employing a polarized armature.

**Polarizing Current.**—A current which produces polarization.

**Polarizing Spectro-Photometer.**—A spectro-photometer employing a polariscope.

**Pole Armature.**—(1) An armature whose coils are wound on separate poles that project from the periphery of a disc, drum, or ring armature. (2) An armature having polar projections.

**Pole Bands.**—Metallic bands placed around a pole for the purpose of supporting guy-rods or brackets.

**Pole-Changing and Interrupting Electrode Handle.**—A handle provided for the ready insertion of the electro-therapeutic electrodes, containing means for interrupting or changing the direction of the current.

**Pole Changer.**—(1) A switch or key for reversing the direction of a current. (2) A reverser. (3) A generator of alternating currents at a telephone exchange, consisting of an electro-magnetically driven pendulum which periodically reverses a call battery.

**Pole-Changing Key.**—(1) A pole changer. (2) A key which effects a reversal.

**Pole-Changing Switch.**—A switch employed for changing the direction of the current in any circuit.

**Pole Clamp.**—An iron clamp on a pole employed for the support of span wires or brackets.

**Pole Climbers.**—Devices employed by line-men for climbing wooden telegraphic poles.

**Pole Clip.**—A pole clamp.

**Pole Counter.**—A hand-operated registering device employed for counting telegraph or other poles.

**Pole Guys.**—A guy employed for the stiffening of a pole.

**Pole Hood.**—A hood or cover placed at the top of a pole.

**Pole Indicator.**—Any device for readily determining the polarity of a pole, of a magnet, or of an electric source.

**Pole-Pieces of Dynamo or Motor.**—A mass of iron or steel connected with the poles of the field-magnets of a dynamo or motor, and shaped to conform to the outline or contour of the armature.

**Pole Platform.**—A platform, capable of supporting one or more men, placed on a terminal pole, and provided with a cable box for the purpose of affording a ready means of inspecting and arranging the conductors in the box.

**Pole Roof.**—A metallic cap or roof of a telegraph or telephone pole.

**Pole Shoe.**—A plate of iron or steel mounted on, and forming the pole-piece of a field magnet, and sometimes used for supporting a field coil.

**Pole Steps.** Steps permanently fastened to a wooden or iron pole to facilitate climbing.

**Pole Support for Arc-Lamps.**—A support placed on the top or end of a pole for the reception of an arc-lamp.

**Pole Tips.** A name sometimes employed for the horns of a dynamo field pole.

**Pole Top.**—A fixture for the top of an aerial pole provided with a number of arms and insulators for the support of additional aerial circuits.

**Poles of Condenser.**—The terminals of a condenser.

**Poles of Magnetic Intensity.**—The earth's magnetic poles as determined by means of observations of magnetic intensity.

**Poles of Magnetic Verticity.**—The earth's magnetic poles as determined by means of a dipping needle.

**Poling Boards.**—Short rough boards laid vertically against the sides of an excavation, in packed soil, and kept in place by cross struts.

**Polishing Bob.**—A disc of tough wood provided on its edge with a ring or rim of leather or hide, on which finely divided emery is placed, employed, when mounted on a shaft and put in rapid rotation, for polishing articles so as to prepare them for electro-plating.

**Polishing Mop.**—A disc formed of circular pieces of calico, felt, or other similar soft material, mounted on a shaft and employed, when put in rapid rotation, for polishing surfaces for electro plating.

**Polycyclic System.**—A multiphase system.

**Polymerism.**—A species of isomerism in which chemical compounds of the same proportional constitution, as determined by analysis, have different properties, due to having different numbers of atoms in their molecules.

**Poly morphic Instrument.**—A term sometimes used for a polymorphic machine.

**Polymorphic Machine.**—An apparatus capable of effecting the transformation of alternating-currents from one species to another.

**Polyphasal Coupling of Magnetic Circuits.**—The inter-linking of magnetic circuits traversed by polyphase magnetic fluxes.

**Polyphase.**—Possessing more than a single phase.

**Polyphase Alternator.**—An alternator capable of supplying polyphase currents.

**Polyphase Apparatus.** Apparatus operated by polyphase currents.

**Polyphase Armature.**—An armature so wound as either to produce polyphase currents, or to be operated by such currents.

**Polyphase Armature-Windings.**—Windings of polyphase generators.

**Polyphase Asynchronous Motor.**—(1) An asynchronous motor operated by multiphase currents. (2) A multiphase induction motor.

**Polyphase Choking-Coil.**—(1) A choking coil in a polyphase system. (2) A choking coil operated by polyphase currents.

**Polyphase Circuits.**—The circuits employed in polyphase-current distribution.

**Polyphase Currents.**—Currents differing in phase from one another by a definite amount, and suitable for the operation of polyphase motors or similar apparatus.

**Polyphase Dynamo.**—A polyphase generator.

**Polyphase Generator.**—An alternator

- which delivers two or more alternating currents definitely differing in phase.
- Polyphase Inductor - Alternator.**—An inductor alternator suitable for producing polyphase currents.
- Polyphase Inductor-Generator.**—(1) A polyphase generator of the inductor type in which no conductor or winding is rotated. (2) A polyphase inductor-alternator.
- Polyphase Motor.**—A motor operated by means of polyphase currents.
- Polyphase Power.**—Power transmitted by means of polyphase currents.
- Polyphase Rotary - Converter.**—A rotary converter operated by or producing polyphase currents.
- Polyphase Switchboard.**—A switchboard suitable for controlling polyphase currents.
- Polyphase Synchronous - Motor.**—A synchronous motor operated by polyphase currents.
- Polyphase Transformer.**—A transformer suitable for use in connection with polyphase circuits.
- Polyphase Transmission.**—Transmission of power by means of polyphase currents.
- Polyphase Working.**—A general term employed to express the application of polyphase currents.
- Polyphased Alternating-Currents.**—A term employed for polyphase currents.
- Polyphaser.**—(1) A term sometimes employed for a polyphase alternator, or generator. (2) A multiphaser.
- Polyphotal Arc-Light Regulator.**—A regulator for arc-lamps suitable for use in a number of series-connected arc lamps.
- Poncelot.**—A name proposed for a unit of activity equal to 100 kilogramme-metres per second; or, approximately, one kilowatt.
- Pondermotive Force.**—The force required for the movement of gross matter.
- Pony Insulators.**—A name given to a particular type of glass telegraph insulator.
- Pony Telegraphic Relay.**—A name applied to a particular form of telegraphic relay.
- Porcelain.**—A variety of insulating substance, made from kaolin.
- Porcelain Insulator.**—Any insulator of porcelain for supporting a wire.
- Porcelain Wire-Tube.**—A porcelain tube employed for passing an electric wire through a partition.
- Porosity.**—A property of matter in virtue of which spaces or pores are left between its constituent atoms and molecules.
- Porous Cell.**—A jar of unglazed earthenware employed in a double fluid voltaic cell to mechanically separate the two electrolytes.
- Porous Cup.**—A porous cell.
- Porous Insulation.**—An insulating material containing air or other gas.
- Porous Jar or Pot.**—A porous cell.
- Porret's Phenomenon.**—An increase in the diameter of a nerve fibre in the neighborhood of the positive pole, when traversed by a voltaic current.
- Portable Conductors.**—Flexible cords containing insulated wires suitable for use with portable lamps, motors, or other devices.
- Portable Electrometer.**—A form of readily transportable Thomson electrometer.
- Portable Igniting Device.**—(1) A portable electric mine-exploder. (2) A portable electric gas-igniter.
- Portable-Lamp Guard.**—A guard provided for the protection of a portable lamp.
- Portable Tachometer.**—A portable speed indicator.
- Portative Power of Magnet.**—The lifting or sustaining power of a magnet.
- Portelectric.**—(1) An electric carrier. (2) A system of electric transportation by means of the successive attractions of a number of hollow helices of insulated wire on a moving iron core.
- Portrait, Electric.**—A portrait formed on paper by the electric volatilization of gold or other metal.
- Position-Finder, Electric.**—An electric device by means of which the position of a distant object can be determined.
- Positive Brush of Dynamo.**—The brush of a dynamo out from which flows the current generated in the armature.
- Positive Brush of Motor.**—The brush connected to the positive terminal of a driving source.
- Positive Carbon.**—That carbon of a voltaic arc out from which the current flows into the arc.
- Positive Charge.**—(1) According to the double-fluid hypothesis, a charge of positive electricity. (2) According to the single-fluid hypothesis, any excess of an assumed electric fluid. (3) A charge of electricity having a positive potential.



**Positive Currents.**—A term employed in telegraphy for currents sent over a line from the positive pole of a battery.

**Positive-Direction of Lines of Magnetic Force.**—The direction in which a free north-seeking pole would move along the lines of force when placed in a magnetic field.

**Positive-Direction of Simple-Harmonic Motion.**—The motion which a body moving with simple-harmonic motion has, when its corresponding circularly moving point moves counter-clockwise.

**Positive-Direction of Electric Convection of Heat.**—A direction in which heat is transmitted through an unequally heated conductor by electric convection during the passage of electricity through the conductor, the same as that of the current.

**Positive-Direction Round a Circuit.**—In a plane circuit looked at from the positive side, a direction opposed to that of the hands of a clock.

**Positive-Direction Through a Circuit.**—In a plane circuit carrying a positive current, a direction through the circuit similar to that of the advance of a corkscrew which is twisted round in the direction of the current.

**Positive Electricity.**—(1) One of the phases of electric excitement. (2) That kind of electric charge produced on cotton when rubbed against resin.

**Positive Electrification.**—(1) The charge of a body with positive electricity. (2) A positive charge. (3) An electrification of positive potential.

**Positive Electrode.**—The electrode connected with the positive pole of an electric source.

**Positive Electromotive Force.**—An E. M. F. which will communicate a positive charge.

**Positive Feeders.**—The feeders that are connected with the positive terminal of a dynamo.

**Positive Fluid.**—(1) The specific fluid that was formerly believed by the adherents of the double-fluid electric hypothesis to be the cause of electric excitement. (2) The surplussage of an assumed single electric fluid.

**Positive Lead.**—In a system of parallel distribution, a lead connected with the positive generator-terminal, or with the positive bus-bars.

**Positive Omnibus-Bars.**—The bus-bars that are connected with the positive terminal of a dynamo.

**Positive Phase of Electrotonus.**—An increase in the electromotive force of a nerve produced by sending a current through the nerve in the same direction as the nerve current.

**Positive Plate of Storage Cell.**—(1) That plate of a storage cell which is converted into, or covered by, a layer of lead peroxide by the action of the charging current. (2) That plate of a storage cell which is connected with the positive terminal of a charging source, and which is, therefore, the positive pole of the cell on discharging.

**Positive Plate of Voltaic Cell.**—(1) The electro-positive element of a voltaic couple. (2) That element of a voltaic couple which is positive in the electrolyte of the cell. (3) The plate which forms above the surface of the electrolyte, the negative pole of the cell.

**Positive Pole.**—That pole of an electric source out of which the current is assumed to flow.

**Positive Potential.**—(1) That potential in a circuit external to a source from which the electric current flows. (2) The higher potential or higher electric level.

**Positive Rotation.**—Left-handed or counter-clockwise rotation.

**Positive Side of Circuit.**—That side of a circuit bent in the form of a circle in which, if an observer stood with his head in the positive region, he would see the current pass around him counter-clockwise.

**Positive Spark.**—A spark produced by the disruptive discharge of a positively charged conductor.

**Positive Terminal.**—The terminal connected with the positive pole of a source.

**Positive Wire.**—The wire connected with the positive pole of a source.

**Positively Excited.**—Charged with positive electricity.

**Pot Operator.**—(1) The operator which is the double inverse of the curl operator. (2) The operator which acting upon a point function in space produces its vector potential.

**Potash Brush.**—A brush employed in cleansing, by the use of a caustic solution, surfaces which are to be electro-plated.

**Potential Dynamometer.**—An electro-dynamometer suitably arranged for the measurement of electric potential differences.

**Potential, Electric.**—(1) The power of doing electric work. (2) Electric level.



**Potential Energy.**—(1) Stored energy. (2) Potency or capability of doing work. (3) Energy possessing the power or potency of doing work, but not actually performing such work.

**Potential Function.**—A point function of space, whose space differentiation gives a vector point-function.

**Potential Galvanometer.**—A term sometimes applied to a voltmeter.

**Potential Gradient.**—(1) The rate-of-fall of potential at a point. (2) A line representing the fall of potential in a circuit.

**Potential Indicator.**—An apparatus for indicating potential difference.

**Potential of Conductors.**—(1) The relation existing between the quantity of electricity in a conductor and its capacity. (2) That property of a conductor whereby electric work is done when an electric charge is moved towards it.

**Potential Receptacle.**—A receptacle in a switchboard, wall, cover, base, or other device, for receiving a plug connected to a potential-indicator, or voltmeter.

**Potentiometer.**—An apparatus for the galvanometric measurement of electromotive forces, or differences of potential, by a zero method, and by relation to a standard E. M. F.

**Potentiometer Voltmeter.**—A voltmeter operating on the potentiometer principle and employing a standard voltaic cell as its basis of measurement.

**Potentiometer Wire.**—A graduated wire employed in a potentiometer for the purpose of securing proportionate linear resistances and thereby proportional potential differences.

**Pounds-Per-Mile-Ohm.**—(1) A standard of conductivity of telegraph or telephone wires. (2) The weight of a uniform wire offering one ohm per mile at standard temperature.

**Poundal.**—(1) The weight of a pound, or the earth's attraction upon the mass of a pound of matter, at any terrestrial locality. (2) A gravitational unit of force.

**Power.**—(1) Rate-of-doing-work, expressible in watts, joules-per-second, foot-pounds-per-hour, etc. (2) Activity.

**Power Cable.**—A cable employed for the electric transmission of power.

**Power Circuits.** Circuits employed for the electric transmission of power.

**Power Coefficient.**—(1) In an alternating-current circuit, the ratio of the power component of electromotive force to the power component of current. (2)

The apparent resistance of an alternating-current circuit.

**Power Cylinder.**—The commutating cylinder of a street-car controller as distinguished from the reversing cylinder.

**Power, Electric.**—Power developed by means of electricity.

**Power Electromotive Force.**—A term sometimes employed for that component of the E. M. F. acting in the same direction with the current, or in phase with it, and expended in overcoming effective or ohmic resistance.

**Power Factor.**—The ratio of the true watts to the apparent volt-amperes in an alternating-current conductor, circuit, or device.

**Power-Factor of Transformer.**—The ratio of the true watts absorbed by a transformer under a given load to the apparent watts absorbed.

**Power Generator.**—A generator of alternating currents at a central telephone exchange.

**Power-House.**—A house provided with the plant necessary for the production of the electric power required in a system of electric distribution.

**Power Measurer, Electric.**—A wattmeter.

**Power Meter.**—A wattmeter.

**Power of Periodic Currents.**—With simple-harmonic currents, the product of effective current strength, the driving effective pressure, and the cosine of the difference of phase between them.

**Power-Wire of Monocyclic System.** The wire or circuit of a monocyclic system employed for supplying currents for the operation of triphase electric motors.

**Poynting's Law.**—At any point in space, electro-magnetic energy moves perpendicularly to the plane containing the lines of electric force and the lines of magnetic force, and the amount of energy per second crossing the unit area of this plane is equal to the product of the intensities of the two forces, multiplied by the sine of the angle between them, and divided by 4 $\pi$ .

**Practical Current.**—A term sometimes employed for the effective current in an alternating current circuit.

**Practical Solenoid.**—A name applied to an ordinary solenoid, in order to distinguish it from an ideal solenoid.

**Practical Unit of Inductance.**—(1) A unit of length equal to the earth's quadrant, or 10<sup>9</sup> centimetres. (2) The henry.

**Practical Unit of Magneto-Motive Force.**—A value of magneto-motive force equal to  $\frac{1}{4\pi}$  multiplied by an ampere of one turn, or equal to one-tenth of an absolute unit of M. M. F.

**Practical Unit of Self-Induction.**—A term frequently used for the practical unit of inductance.

**Practical Units.**—Definitely related multiples or sub-multiples of the absolute or centimetre-gramme-second units.

**Preamble.**—In telegraphy, the opening words of a despatch containing the names of the sending and delivery stations, the number of words in the message, the code time, and other service instructions, as distinguished from the text of the message.

**Prefix.**—In telegraphy, a code letter or group of letters prefixed to a message to indicate its nature or relative importance.

**Prepayment Meter.**—A device whereby a certain electric service is given by means of an electric penny-in-the-slot apparatus.

**Presbyopic.**—Far-sighted.

**Press Button.**—A push-button.

**Press Message.**—(1) A message directed to a newspaper or daily publication. (2) A news message.

**Press Telegram.**—A press message.

**Pressant.**—A name proposed for a unit of magneto-motive force.

**Pressol.**—(1) A press switch or push connected to the end of a flexible pendant conductor. (2) A pendant press-button.

**Pressure, Electric.**—A term sometimes employed for difference of potential, or electromotive force.

**Pressure Equalizer.**—(1) An automatic device employed in connection with a storage battery to maintain a uniform pressure at its terminals under different loads. (2) A regulating device employed in a system of electric distribution for maintaining the pressure uniform.

**Pressure Indicator.**—Any device for indicating the electric pressure in a circuit.

**Pressure Panel of Switchboard.**—That panel in a switchboard which contains apparatus for measuring the mean electric pressure in the power house.

**Pressure Recording-Gauge.**—Any form of recording voltmeter.

**Pressure Wires.**—Small insulated copper conductors, employed in a system of underground street mains, extending from points of junction between the feeders and the mains to the central station, to

indicate in the central station the pressure supplied to the mains.

**Pricking Wires.**—A method sometimes adopted for locating a wire, by connecting a battery with one pole to earth and the other pole to the wire sought for, by means of a brad-awl or needle inserted through the gutta-percha insulating material.

**Primary Admittance.**—The admittance of the primary coil or coils of an alternating-current transformer or induction machine.

**Primary Ampere-Turns.**—The ampere-turns in the primary coil of a transformer.

**Primary Battery.**—The combination of a number of separate primary cells to form a single electric source.

**Primary Cell.**—A term sometimes employed for a voltaic cell.

**Primary Coil of Transformer.**—(1) That coil of an induction coil or transformer on which the primary electromotive force is impressed. (2) The driving coil of a transformer. (3) The coil which receives energy prior to transformation.

**Primary Currents.**—Currents flowing in a primary circuit, as distinguished from currents flowing in a secondary circuit.

**Primary Cut-Out.**—A cut-out placed in the primary circuit of a transformer.

**Primary Electric Clock.**—A term sometimes employed in place of controlling or master clock.

**Primary Electric Heater.**—A term proposed for the main electric heater in a building.

**Primary Electromotive Force.**—The electromotive force applied to the primary coil of a transformer.

**Primary Element of Induction Motor.**—The element connected with the line or lines, as distinguished from the element closed upon itself.

**Primary Fuse Box.**—A fuse box placed in the primary circuit of an induction coil or transformer.

**Primary Impedance.**—(1) The impedance of the primary coil of a transformer, or of an induction machine. (2) The impedance of the primary coil of a transformer, or of an induction machine, independent of the reactance of mutual inductance, or the C. E. M. F. of mutual linkage.

**Primary Plate of Condenser.**—That plate of a condensing transformer in which the inducing charge is placed in order to induce a charge of different potential in the secondary plate.

**Primary Spiral of Induction Coil.**—The primary of an induction coil or transformer.

**Prime Conductor.**—The positive conductor of a frictional electric or electrostatic machine.

**Prime Flux-Density.**—The magnetic density of the prime magnetic flux in a ferric circuit.

**Prime Magneto-Motive Force.**—The magneto-motive force due to the magnetizing current in a ferric circuit.

**Prime Magnetic Flux.**—(1) A term employed for the flux produced in a ferric circuit by the prime magneto-motive force, as distinguished from the induced, aligned, or structural magneto-motive force. (2) Magnetizing force as distinguished from magnetic induction.

**Prime Motor.**—A prime mover.

**Prime Mover.**—A motor which drives the secondary motors or movers.

**Primordial Atoms.**—The atoms or compounds into which it has been assumed that the so-called elementary atoms of ordinary matter are broken up by means of the cathode rays.

**Principal Circuit.**—A main circuit as distinguished from a derivation circuit.

**Principal Current.**—A main current as distinguished from a derivation current.

**Principal Telegraphic Circuit.**—A term sometimes used for the main circuit.

**Principal Telegraphic Current.**—A term sometimes employed for the main current.

**Printing Telegraphy.**—A system of telegraphy in which the messages received are printed on a paper fillet.

**Prism Error of Compass.**—The error in a magnetic bearing due to an inaccurate setting of the prism relatively to the compass card.

**Probable Error of an Observation.**—A magnitude of accidental error in the repeated observation of a quantity, such that it is just as probable that the real accidental error is greater as that it is less than this magnitude.

**Probe, Electric.**—A metallic conductor inserted in the body of a patient in order to ascertain the position of a bullet or other foreign metallic substance.

**Process of Carbonization.**—Means for carbonizing carbonizable material.

**Production of Cold by Electricity.**—The absorption of energy, and consequent reduction of temperature at a thermoelectric junction, by the passage of an

electric current in a certain direction across such junction.

**Production of Electricity by Light.**—The production of electric difference of potential by the action of light.

**Prognosis, Electric.**—A prognosis or prediction of the fatal or non-fatal termination of a disease from an electric diagnosis, based on the exaggerated or diminished reactions of the excitable tissues of the body, when subjected to the varying influences of electric currents.

**Progression of Magnetic Flux.**—In a polyphase motor, the circular motion of the magnetic flux around the field or armature.

**Projecting Power of Magnet.**—(1) The range within which a magnet produces sensible attraction or repulsion. (2) The power of an electro-magnet to repel a suitably placed armature.

**Projection Arc-Lamp.**—An arc-lamp suitable for use in a projector or search-light.

**Projector, Electric.**—A projector or search-light provided with an electric arc-light at its focus.

**Projection Armatures.**—Slotted armatures in which the width of the slot is sufficiently great to leave a distinct projection in the armature surface as distinguished from tunnel armatures in which the slot is very narrow.

**Prony Brake.**—A mechanical device for measuring the power of a driving shaft by the application of a brake to the periphery of a wheel firmly keyed on the shaft.

**Proof-Plane.**—A small insulated conductor employed to take and carry electric charges from the surfaces of insulated charged conductors.

**Proportional Coils.**—Pairs of resistance coils, generally of 10, 100 and 1,000 ohms each, forming the proportional arms of a balance or bridge, and employed in the box or commercial form of Wheatstone's bridge.

**Proportionate Arms.**—The two resistances or arms of an electric bridge, whose relative or proportionate resistances only are required to be known, in order to determine in connection with a known resistance, the value of an unknown resistance placed in the remaining arm of the bridge.

**Proposed Definition for 2,000 Candle-Power Arc.**—(1) Such an arc as will require at ordinary pressures 450 watts actively to maintain it. (2) A 450-watt arc.



**Propulsion, Electric.**—A general term for driving by electric power.

**Prostration, Electric.**—Physiological exhaustion or prostration, resembling that produced by sun-stroke, resulting from exposure to an unusually powerful arc.

**Protecting Battery.**—In submarine cable telegraphy, a battery permanently connected to a faulty cable through a high resistance, for the purpose of sending a negative current through the fault in order to keep the exposed surface of the conductor free from corrosion salts.

**Protection of Houses, Ships or Buildings, Electric.**—Means for protection from the destructive effects of a lightning discharge, consisting essentially in the use either of lightning-rods or of an enclosing conducting shell.

**Protection of Metals, Electric.**—The protection of a metal from corrosion by placing it in connection with another metal, which, when exposed to the corroding liquid, vapor or gas, will form with the surrounding liquid the positive element of a voltaic couple and will, therefore, alone be corroded.

**Protection of Ship's Sheathing, Electric.**—Attaching pieces of zinc to the copper sheathing of a ship for the purpose of preventing the corrosion of the copper by the water.

**Protective Action.**—(1) The electric protection of metals. (2) The protection of structures from lightning by lightning protectors.

**Protective Sheath.**—A device attached to a transformer or converter, consisting of a copper strip or plate connected to the earth and interposed between the primary and secondary windings, to prevent any connection from taking place between the high-potential primary and the low-potential secondary circuit.

**Protective Throw.**—A term proposed for the protection afforded by a magnetic field to paramagnetic metals exposed to chemical action.

**Protoplasm.**—Bioplasm.

**Psychrometer.**—A form of recording hygrometer.

**Public Supply Instruments.**—Electric meters designed for registering the current or energy supplied to a consumer.

**Pull.**—A contact-maker similar in general construction to a push-button, but operated by a pull instead of by a push.

**Pull Contact.**—Any contact that is effected by the movement of a pendant or pull.

**Pulley.**—A wheel placed on a shaft for the driving of the same by means of a belt.

**Pull-Off.**—(1) An insulator employed on curves to hold the trolley wire in proper position. (2) A steel wire attached to a trolley wire through an insulator, and employed to pull the trolley wire into position over a curve in the track.

**Pull-Off Pole.**—A pole provided for the suspension of a pull-off wire, or wires.

**Pulsating Current.**—A pulsatory current.

**Pulsating Electromotive Force.**—An electromotive force whose direction is pulsatory.

**Pulsating Motor.**—A motor employing a reciprocating movement in its armature as opposed to the ordinary rotary motion.

**Pulsation.**—(1) A quantity of the nature of an angular velocity, equal to  $2\pi$  multiplied by the frequency of the oscillation, or to  $2\pi$  divided by the duration of a single period. (2) In a simple-harmonic current circuit, the angular velocity of the corresponding circularly moving point.

**Pulsation, Electric.**—An electric pulse or oscillation.

**Pulsation of Reactance.**—Variations periodically occurring in the apparent reactance of an alternating-current circuit or machine.

**Pulsation of Resistance.**—Periodic variations in the apparent resistance of an alternating current circuit or apparatus.

**Pulsatory Continuous-Current.**—A current whose direction remains constant, but whose intensity is subject to steady changes.

**Pulsatory Electromotive Force.**—An electromotive force whose value is subject to pulsatory changes.

**Pulsatory Magnetic-Field.**—A field whose strength pulsates in such a manner as to induce oscillatory currents in neighboring circuits.

**Pulsatory Magnetism.**—Magnetism produced by pulsatory currents.

**Pulse, Electric.**—(1) An electric oscillation. (2) A momentary flow of electricity through a conductor which gradually varies from zero value to the maximum, and then to zero value again, like a pulse or vibration in an elastic medium.

**Pumping of Alternating-Current Dynamo.**—A pulsation in the motion of a synchronously-running alternating-current generator or motor, due to imperfect synchronism.

**Pumping of Electric Lights.**—A term



sometimes applied to a pulsatory or periodic increase or decrease in the brilliancy of lights.

**Punched-Clip Switch.**—A form of switch in which the clips are punched out of sheet metal.

**Puncher.**—In automatic telegraphy, a perforator.

**Punning of Telegraph Pole.**—The process of packing the earth around the base of a telegraph pole.

**Pupillary Photometer.**—A photometer whose operation is dependent on the diminution of the diameter of the pupil of the eye with the intensity of the light striking the eye.

**Pure Spectrum.**—A single spectrum or distribution of luminous frequencies as distinguished from a spectrum which is formed by the superposition of a number of spectra slightly displaced with reference to one another.

**Push.**—A term sometimes applied to a push button.

**Push Box.**—A box provided for the reception of the mechanism of a push button or push.

**Push Button.**—A device for closing an electric circuit by the movement of a button.

**Push-Button Rattler.**—(1) A device connected with a push-button to show that a bell connected at a distant point in the circuit of the button rings when the button is pressed. (2) A push-button combined with an electro-magnetic vibrator.

**Push-Button Socket.**—A socket provided with a push-button for the closing of a circuit.

**Push-Button Socket-Key.**—An incandescent lamp-socket so provided with a push-button key as to permit the lamp to be readily lighted or extinguished by the same hand that holds it.

**Push-Button Switch.**—A switch operated by a push-button.

**Push Contact.**—A name sometimes applied to a push button.

**Putting Straight.**—The operation of restoring the normal condition of wires which have been crossed at two way stations.

**Pyknometer.**—A term sometimes used

for a specific gravity bottle, employed in determining the specific gravity of a liquid.

**Pyr.**—(1) A bougie-decimale. (2) A proposed unit of luminous intensity equal to the one-twentieth of the Violle standard. (3) A proposed name for the one-twentieth of the Violle standard.

**Pyrheliometer.**—An apparatus for measuring the energy of solar radiation.

**Pyro-Electric.**—Pertaining to pyro-electricity.

**Pyro-Electric Crystal.**—Any crystalline substance capable of producing pyro-electric phenomena on being unequally heated.

**Pyro-Electricity.**—Electricity produced in certain crystalline bodies by their unequal heating or cooling.

**Pyrogravure.**—A process for the decoration of wood, copper, or glass, by the burning action of an electrically or otherwise heated tool.

**Pyro-Magnetic.**—Of or pertaining to pyromagnetism.

**Pyro-Magnetic Electric Device.**—Any device operated by or employing pyromagnetism.

**Pyro-Magnetic Generator or Dynamo.**—An apparatus for producing electricity directly from the heat derived from burning fuel.

**Pyro-Magnetic Motor.**—A motor consisting of an armature formed of a disc or ring of thin steel, which is set in motion when unequally heated, by reason of the difference in the coercive force so produced.

**Pyro-Magnetism.**—A term sometimes applied to the phenomena of the combined effects of magnetism and heat.

**Pyrometer.**—An instrument for determining temperatures higher than those which can be readily measured by thermometers.

**Pyrometer, Electric.**—A device for determining the temperature of a body by the measurement of the electric resistance of a platinum wire exposed to the heat to be measured.

**Pyr-Steradian.**—(1) The flux of light corresponding to the luminous intensity of one pyr extending over the solid angle of one steradian. (2) A term sometimes used for lumen.

## Q

**Q or q.**—A contraction for electric quantity.

**Quad.**—(1) A contraction for quadruplex telegraphy. (2) An abbreviation sometimes employed for the quadrant or the unit of self-inductance.

**Quad-Meter.**—(1) A secohm meter. (2) An instrument for measuring inductance.

**Quadrant.**—A term proposed for the earth quadrant or practical unit of self-induction, now officially recognized as the henry. (2) The length of the arc, from the pole to the equator, on a terrestrial meridian circle extending through Paris, or very nearly 10,000 kilometers.

**Quadrant Electromotor.**—An electrometer in which an electrostatic charge is measured by the attractive and repulsive force exerted by four plates or quadrants on a light needle of aluminium suspended between them.

**Quadrantal Deviation of Mariner's Compass.**—(1) The deviation of a magnetic needle due to the induced magnetism in the iron of a ship acting as a mass of soft iron, and not as a permanent magnet. (2) The deviation of a compass needle on board ship which changes sign once in each quadrant.

**Quadrantal Error.**—The quadrantal deviation of a mariner's compass as distinguished from either the semicircular or the heeling error.

**Quadrature.**—A term applied to express the fact that one simple-harmonic quantity lags 90° behind another.

**Quadruplex Circuit.**—A circuit employed in quadruplex telegraphy.

**Quadruplex Connector.**—Any connector suitable for connecting the four ends of four wires.

**Quadrupolar Dynamo or Generator.**—A multipolar dynamo having four poles in its field frame, or four magnetic circuits through its armature.

**Quadrupolar Field.**—A field produced by four separate magnet poles.

**Quadruplex.**—Of or pertaining to quadruplex telegraphy.

**Quadruplex Balance.**—The balance obtained in a quadruplex circuit in order to permit quadruplex transmission.

**Quadruplex Circuit.**—Any single circuit over which four separate messages can be simultaneously transmitted, two in one

direction and the remaining two in the opposite direction.

**Quadruplex Telegraph.**—A general term embracing the apparatus employed in quadruplex telegraphy.

**Quadruplex Telegraphy.**—A system for the simultaneous transmission of four messages over a single wire, two in one direction, and two in the opposite direction.

**Quadruplex Telephony.**—The simultaneous transmission of four telephonic messages, two in one direction and the remaining two in the opposite direction.

**Quadruplex Transmission.**—Telegraphic or telephonic transmission effected by means of a quadruplex system.

**Quadruplex Working.**—Operating a telegraph or telephone line by quadruplex apparatus.

**Quadruplex Re-Entrant Armature Winding.**—An armature provided with four independent conducting paths or windings, each of which is independently re-entrant.

**Qualitative Analysis.**—A chemical analysis which merely ascertains the kinds of elementary substances present.

**Quality of Musical Sound.**—(1) That property of a musical note which enables it to be distinguished from another which possesses the same wave-length and amplitude; i. e., the same pitch and loudness. (2) The timbre of sound.

**Quality of Radiation.**—The character of radiation in regard to the frequency and amplitude of the vibration it contains.

**Quantitative Analysis.**—(Chemical) analysis which ascertains the different proportions in which the component substances enter into a compound substance.

**Quantity Armature.**—An old term for an armature wound with a few coils and of comparatively low resistance.

**Quantity Connection for Condensers.**—A term formerly employed for the multiple connection of a number of condensers.

**Quantity Current.**—An old term for a current produced by a voltaic battery connected in multiple-arc.

**Quantity Efficiency of Storage Battery.**—(1) The ratio of the number of ampere-hours taken out of a storage bat-

- tery to the number of ampere-hours put in the battery in charging it. (2) The ampere-hour efficiency.
- Quantity, Electric.**—The amount of electricity present in any current or charge.
- Quantity Meter, Electric.**—A coulomb meter.
- Quantity of Light.**—(1) Flux of light. (2) The product of the luminous intensity and the solid angle through which it is emitted.
- Quantivalence.**—A general term for the containing capacity of the elements.
- Quarter-Load Efficiency of Transformer.**—The efficiency of a transformer at quarter-load.
- Quarter-Period.**—The time in which a vibrating body, or alternating quantity, completes one quarter of its cycle.
- Quarter-Phase.**—The condition of diphasic relationship or the separation of two alternating quantities by a quarter period.
- Quarter-Phase Armature.**—A polyphase armature which will produce quarter-phase currents.
- Quarter-Phase Armature-Winding.**—Such a winding of a polyphase armature as will permit it to produce quarter-phase currents.
- Quarter-Phase Bar-Winding for Armature.**—A form of bar winding employed in the armature of a quarter-phase generator.
- Quarter-Phase System.**—A two-phase system of alternating current distribution employing two currents dephased by a quarter period.
- Quartz Fibre.**—A suspension fibre obtained by drawing a thread from a fused crystal of quartz.
- Quasi-Resonance.**—(1) Imperfect resonance. (2) The production of resonance in a primary alternating-current circuit by

the adjustment of a secondary circuit or currents.

- Quega.**—A prefix for a quintillion, or  $10^{18}$ .
- Quegohm.**—A quintillion ohms, or a thousand million megohms.
- Quick.**—To cover with an adherent film of mercury.
- Quick-Break.**—A break of a circuit obtained by means of a quick-break switch.
- Quick-Break Switch.**—A switch by means of which a circuit may be rapidly broken.
- Quickened.**—A term employed in electroplating for a surface which has been provided for the reception of a deposit of silver by dipping the article in a quickening liquid.
- Quickening Liquid.**—A term sometimes applied to the quickening solution.
- Quickening Process.**—A process employed in quickening.
- Quickening Solution.**—A solution of a salt of mercury in which objects to be electroplated are dipped after cleansing, just before being placed in a plating bath.
- Quicking.**—Subjecting to the quicking process.
- Quicking Solution.**—A quickening solution.
- Quiet Arc.**—A noiseless arc.
- Quiet Commutation.**—Commutation devoid of sparking.
- Quiet Discharge.**—A name given to a convective discharge in order to distinguish it from a noisy disruptive discharge.
- Quintuple Harmonic.**—A harmonic of five times the frequency of the fundamental.
- Quivering of Magnetic Field.**—The pulsation of magnetic flux either under the leading pole-piece of a generator, or the trailing pole-piece of a motor, due to the successive commutations of the advancing armature coils.

## R

- R.**—A contraction for ohmic resistance.
- R.**—A symbol proposed for magnetic resistance or reluctance.
- r.**—A symbol for radius.
- $\rho$ .**—A symbol for specific electric resistance or resistivity.
- R. M. S. Current.**—(1) A term proposed

for the square root of the mean square of the current. (2) The effective current.

- R. P. M.**—An abbreviation for revolutions per minute.
- R. Q.**—In submarine telegraphy, a request for repetition of a doubtful word, phrase, or sentence.
- Raad.**—A name formerly given by the Arabians to the torpedo or electric ray.

**Raceway.**—A continuous space provided in a conduit for the insertion or removal of a conductor or conductors.

**Racing of Dynamo.**—A general term for any excessive speed produced in a dynamo-electric machine by the sudden removal of its load, as by the breaking of a belt.

**Racing of Motor.**—An increase in the speed of an electric motor when the load is suddenly removed.

**Rack-Rail-Incline Electric Railway.**—A means adopted for the passage of a trolley or other car over a steep grade by the use of a rack rail to be operated by the ordinary incline system where the line is too long.

**Racking of Armature Conductors.**—A term sometimes applied to a sudden drag exerted on the armature conductors of a dynamo or motor during operation.

**Rad.**—(1) A unit quantity of time-flux of light. (2) A lumen-second or one lumen, maintained during one second. (3) A name proposed for the lumen-second.

**Radial Armature.**—A term sometimes used for pole armature.

**Radial Current.**—A term proposed for a current which radiates from a centre.

**Radial Photometer.**—A photometer whose bench is movable about a vertical axis, so as to be readily turned into any azimuth, and employed to determine the intensity of the light emitted by a luminous source in various directions.

**Radial Truck.**—A triple-truck support for a car-body, in which the car is supported on the centres of the end trucks in such a manner that they may swivel freely, carrying the middle truck between them.

**Radially-Laminated Armature.**—An armature core whose iron consists of thin discs suitably supported on the shaft.

**Radian.**—(1) A unit angle. (2) An angle whose circular arc is equal in length to its radius; or, approximately,  $57^{\circ} 17' 45''$ .

**Radian-per-Second.**—A unit of angular velocity of a rotating body.

**Radiant Efficiency.**—The ratio of the light-giving radiation to the total radiation.

**Radiant Energy.**—Energy transferred or charged on the universal ether.

**Radiant Matter.**—(1) That condition of the gaseous matter that constitutes the residual atmosphere of high vacuum. (2) Ultra-gaseous matter.

**Radiant Vector.**—A vector point-function which represents the rate and direc-

tion at and in which energy is being transferred in space.

**Radiophonic Transmission.**—(1) Transmission by means of a photophone. (2) Transmission of articulate speech along rays of light.

**Radiate.**—(1) To transfer energy by means of waves. (2) To issue radially, or by rectilinear divergence, from a common centre.

**Radiating.**—(1) Transferring energy by means of waves. (2) Issuing radially.

**Radiation.**—(1) A transference of energy by means of waves. (2) Issuing radially from a common centre.

**Radiation Constant.**—The amount of heat lost by radiation in unit time when the temperature of the radiating body is one degree of the thermometric scale above that of the surrounding air.

**Radiation, Electric.**—(1) The transference of electric energy by means of electro-magnetic waves set up in the surrounding ether. (2) That property of a rapidly oscillating or alternating-current circuit by virtue of which energy is expended by the circuit in the form of electro-magnetic waves.

**Radiation Meter.**—(1) An instrument for measuring radiation. (2) A meter employed for the measurement of the radiation emitted by an electric oscillation, whose operation is dependent on the elongation produced in a stretched wire by the heat developed therein by currents induced by the rapidly oscillating field of force.

**Radiation of Electricity.**—The radiation of electric energy by means of electro-magnetic waves.

**Radiation of Magnetic Flux.**—(1) The passage of magnetic flux out of the north-seeking pole of a magnet or solenoid. (2) The issue of magnetic flux from a magnetic pole in approximately radial paths.

**Radiator, Electric.**—(1) An electric heater so placed as to radiate its heat into a room or other space to be heated. (2) An electric circuit which radiates or produces electro-magnetic oscillations or waves.

**Radicals.**—(1) Unsaturated atoms or groups of atoms, in which one or more of the bonds are left open or free. (2) Ions.

**Radiograph.**—The word now generally employed for a picture taken by means of X-rays.

**Radiography.**—(1) The process of taking radiographs, or X-ray pictures. (2) X-ray photography.



**Radiometer.**—(1) A word frequently employed for the Crookes radiometer. (2) An instrument in which the rotation of a light set of vanes is produced in an ultragaseous space, by radiant energy.

**Radio-Micrometer.**—An electric apparatus for measuring the intensity of radiant heat.

**Radiophone.**—A name sometimes given to a photophone.

**Radiophonic.**—Of or pertaining to the radiophone.

**Radiophonic Sounds.**—Sounds resulting from the direct action of radiation on certain bodies.

**Radiophony.**—The production of sound by a body capable of absorbing radiant energy, when an intermittent beam of heat or light falls on it.

**Radius of Gyration.**—In a rotating body, a radial distance from the centre of rotation at which, if the entire mass of the body were collected, its moment of inertia would remain the same.

**Rail-Bond, Electric.**—Any device whereby threads of contiguous rails are placed in good electrical contact with one another, so that the resistance of the rails, employed as a portion of the return-circuit, may be as small as possible.

**Rail Bonding.**—Connecting rails by electric bonds, for the purpose of effecting intimate electric contact between them.

**Rail Joint.**—A rail bond.

**Railroad, Electric.** A railroad or railway on which the cars are driven or propelled by means of electric motors placed on the cars, or on locomotives.

**Railroad Switchboard.**—A switchboard employed in a railroad power-house, to which the generator and feeder terminals are attached.

**Railway Circuit.**—A circuit for operating an electric railway.

**Railway Current-Controller.**—(1) A term formerly given to a form of switchboard employed for controlling the output of an electric power-house. (2) A railroad motor-controller for starting and stopping the cars, and for varying their speed.

**Railway, Electric.**—An electric railroad.

**Railway Generator.**—A dynamo-electric machine which develops the current employed in systems of electric railways.

**Railway Line-Crossing.**—(1) Means provided for supporting the separate trolley wires at places where two or more wires cross one another. (2) A trolley crossing.

**Railway Line-Section.**—One of the independent divisions into which the trolley wire and its feeder system are divided by means of section insulators, for the purpose of preventing an accidental ground at one point from interrupting the traffic over a considerable portion of the road.

**Railway Motor.**—An electric motor employed for the propulsion of an electric street or trolley car.

**Railway Power-Generator.**—A term sometimes used for railway generator.

**Railway Return Circuit.**—(1) A term frequently employed for the ground-return of a trolley system. (2) The return circuit, generally a grounded circuit, employed in trolley systems.

**Railway Return-Wire.**—(1) A copper wire employed for the purpose of aiding and re-inforcing the ground-return, so as to decrease the wasteful expenditure of energy due to the poor quality of the rail and track, with its numerous joints, as a conductor. (2) A term sometimes employed for a railway return-circuit.

**Railway Section-Insulators.**—Insulators employed for the purpose of dividing the trolley wire or line into a number of independent sections.

**Railway Turn-Out.**—(1) In a single track road, an extra track provided to permit the passage of a car in the opposite direction. (2) A local section of track into which a car can be run, so as to leave the main line clear.

**Range Finder, Electric.**—Fiske's electric range finder.

**Range Indicating System.**—On warships a telegraphic indicating-system for announcing, at any or all of the guns, the range or distance of the target as signalled from the range finder.

**Ratchet-Pendant Argand Electric Gas-Burner.**—A ratchet-pendant electric burner adapted for lighting an Argand gas burner.

**Ratchet-Pendant Electric Gas-Burner.** A gas burner in which one pull on a pendant turns on the gas and ignites it by means of an electric spark from a spark coil, and the next pull turns it off.

**Ratchet-Pendant Electric Candle Burner.**—A pendant for both lighting and extinguishing a candle gas-jet.

**Rate-of-Doing-Work.**—(1) Activity. (2) Power.

**Rated Candle-Power.**—A nominal candle-power.

**Ratio Arms of Bridge.**—A name some-

times given to the proportionate arms of a bridge.

**Ratio of Conversion.**—A term sometimes employed instead of ratio of transformation.

**Ratio of Transformation.**—The ratio between the electromotive force produced at the secondary terminals of an induction coil, or transformer, and the electromotive force impressed on the primary terminals.

**Ray.**—(1) A term sometimes employed for a single line of light or other form of radiant energy, as distinguished from a pencil of rays or a beam. (2) A line of radiant energy flux.

**Ray, Electric.**—(1) A species of fish which possesses the power of producing electricity. (2) A single line of electric flux-energy.

**Rayleigh's Current-Weigher.**—A form of electro-dynamometer balance.

**Rayleigh's Form of Clark's Standard Voltaic Cell.**—A modified form of Clark's standard voltaic cell.

**Reactance.**—(1) The inductance of a coil or circuit multiplied by the angular velocity of the sinusoidal current passing through it. (2) A quantity whose square added to the square of the resistance gives the square of the impedance, in a simple-harmonic current circuit.

**Reactance Factor.**—The ratio of the resistance of a coil, conductor, or circuit, to its ohmic resistance.

**Reactance of Condenser.**—(1) The reciprocal of the product of the capacity of a condenser, and the angular velocity of the simple-harmonic pressure with which it may be connected. (2) A quantity which divided into the alternating current pressure at condenser terminals, gives the current strength in the condenser.

**Reactance of Mutual Inductance.**—In an alternating current circuit, the product of a mutual inductance and the angular velocity.

**Reacting Inductive Electromotive Force of Primary Circuit.**—(1) The C. E. M. F. of self-induction in a primary alternating-current circuit. (2) The C. E. M. F. of mutual-induction in a primary alternating-current circuit, or the C. E. M. F. due to current in the secondary circuit.

**Reaction.**—In electro-therapeutics, muscular contractions following the closing or opening of an electric circuit through the nerves or muscles.

**Reaction Coil.**—(1) A magnetizing coil

surrounded by a conducting covering or sheathing which opposes the passage of rapidly alternating currents less when directly over the magnetizing coil than when a short distance from it. (2) A choking coil.

**Reaction Machine.**—An induction machine.

**Reaction Motor.**—An induction motor.

**Reaction of Degeneration.**—An alteration in the behavior of nerves and muscles under electric stimulation, due to disease.

**Reaction of Exhaustion.**—A condition of nervous or muscular irritability to electric excitation, when a certain reaction produced by a given current strength cannot be reproduced without an increase in current strength.

**Reaction Principle of Dynamo-Electric Machine.**—The mutual interaction between the current generated in the armature coils and the field coils of a continuous-current dynamo-electric machine, each strengthening the other until the full-working current which the machine is capable of developing is produced.

**Reaction Telephone.**—An electro-magnetic telephone in which the currents induced in a coil of fine wire attached to the diaphragm are passed through the coils of an electro-magnet, each thus reacting on and strengthening the other.

**Reaction Time.**—The time required for the effects of an electric current to pass from a nerve to a muscle.

**Reaction-Wheel, Electric.**—A wheel driven by the reaction of a convective discharge.

**Reactive Circuit.**—A circuit containing either inductance or capacity alone, or both inductance and capacity.

**Reactive Coil.**—A reaction coil.

**Reactive Drop.**—The drop in a circuit or conductor due to its reactance, as distinguished from the drop due to its ohmic resistance.

**Reactive Effect.**—The choking effect of reactance in an alternating-current circuit.

**Reactive Electromotive Force.**—In an alternating-current circuit, that component of the electromotive force that is in quadrature with the current and is employed in balancing the C. E. M. F. of inductance.

**Reading Microscope.**—A form of microscope employed for the measurement of very small distances.

**Reading Telescope.**—A telescope em-

played in electric measurements for reading the deflections of a galvanometer.

**Real Cable.**—In duplex submarine cable-telegraphy the actual cable, as distinguished from the artificial cable.

**Real Efficiency of Storage Battery.**—(1) The ratio of the number of watt-hours taken out of a storage battery to the number of watt-hours put into the battery in charging it. (2) The energy efficiency, or watt-hour efficiency, of a storage battery, as distinguished from its quantity efficiency, or ampere-hour efficiency.

**Real Hall Effect.**—A transverse electromotive force produced by magnetic flux through conductors conveying electric currents in a manner somewhat similar to that in which the Faraday effect is produced.

**Real Image.**—(1) An image formed by rays of light that actually meet in the various visible points, as distinguished from a virtual image. (2) An image which is capable of being received on a screen.

**Rehabbitting.**—The operation of replacing the Babbitt metal in the bearings of a machine.

**Recalcescence.**—A property possessed by a bar or a mass of cooling incandescent steel, of again becoming incandescent after having cooled sufficiently to no longer emit luminous heat.

**Recalibration.**—A new calibration of an instrument.

**Received Current.**—A term used in telegraphy to distinguish the currents that come in over a line from a distant station, from those that are sent out to a distant station.

**Receiver.**—A name sometimes given to a receiving instrument of a gramophone, graphophone, telephone, or telegraph instrument.

**Receiver Magnet.**—A receiving magnet.

**Receiving End of Line.**—That end of a line at which the currents arrive, as distinguished from the end at which they are sent out.

**Receiving Leg of Telegraphic Loop.**—The wire of a telegraphic loop upon which messages are received, as distinguished from the sending leg.

**Receiving Magnet.**—(1) A name sometimes given to the relay of a telegraphic system. (2) In general, any magnet used directly in the receiving apparatus at the receiving end of a telegraph or telephone line.

**Receiving Signaller.**—(1) A receiving operator. (2) An operator engaged in receiving a telegraphic message.

**Receiving Transformer.**—A transformer at the receiving end of a circuit.

**Receptacle.**—In incandescent lighting a permanent device for receiving an attachment plug.

**Receptive Device.**—(1) A translating device. (2) In electrotechnics, a magneto- or electro-receptive device. (3) A device for receiving energy and utilizing or transforming it.

**Reciprocal.**—The quotient arising from dividing any quantity into unity.

**Reciprocating Motor.**—A motor with a reciprocating action, or with a motion alternately in opposite directions, as distinguished from a rotary motor.

**Reciprocal Vectors.**—Two vectors whose product is equal to the numeric unity.

**Recoil Circuit.**—A term sometimes applied to the circuit that lies in the alternative path of a discharge.

**Recoil Kick of Disruptive Discharge.**—A kick or reaction produced by a disruptive discharge.

**Recorder.**—A word sometimes used for either a telegraphic recorder, or a siphon recorder.

**Recorder Ammeter.**—An ammeter whose indications are permanently recorded.

**Recorder Battery.**—The local battery supplying the magnets, or mouse-mill, of a siphon recorder.

**Recorder Circuit.**—The circuit of a siphon recorder.

**Recorder Coil.**—The receiving coil of a siphon recorder.

**Recorder Magnets.**—The magnets which supply the magnetic flux in which moves the receiving coil of a siphon recorder.

**Recorder Shunt.**—A shunt of low resistance placed across the terminals of the coil of a siphon-recorder during sending.

**Recorder Signals.**—Signals received on a siphon recorder by the projection of ink upon a moving strip of paper from a small glass siphon connected with the receiving coil.

**Recorder Slip.**—The strip of paper recording, or prepared for recording, siphon-recorder signals.

**Recorder Switch.**—The switch employed in connection with a siphon recorder for changing from sending to receiving connections.

**Recorder - Vibrator.**—An electrome-



chanical vibrator for forcing an intermittent flow of ink from the siphon of a recorder on to a band of paper moving beneath it.

**Recording Compass.**—A compass so arranged as to record the directions of the needle, and to sound an alarm in case the course of the vessel deviates any predetermined number of degrees.

**Recording Drum.**—A cylindrical drum covered by a sheet or strip of paper on which a chronographic or other record is made.

**Recording Meter.**—Any form of electric meter that records its indications.

**Recording Voltmeter.**—A voltmeter whose indications are permanently recorded.

**Recording Wattmeter.**—(1) A recording form of wattmeter. (2) A dial watt-hour or kilowatt-hour meter.

**"Recovery" of Condenser.**—The condition of a condenser whose dielectric has regained its neutral condition after having been strained by a charge.

**Rectal Electrode.**—An electrode suitable for the treatment of the rectum.

**Rectangular Curve.**—A curve whose outline approximates or conforms to a rectangular shape.

**Rectangular Type of Periodically Alternating Electromotive Force.**—An electromotive force whose variations of strength are represented by a curve of rectangular outline.

**Rectangular Variation Diagram.**—A diagram drawn to rectangular coordinates, and representing the variation of any quantity or quantities.

**Rectification of Alcohol, Electric.**—A process whereby the bad taste and odor of alcohol, due to the presence of aldehydes, are removed by the electrical conversion of the aldehydes into true alcohol through the addition of hydrogen atoms.

**Rectified.**—Commutated, or caused to take one and the same direction.

**Rectified Currents.**—Commutated currents.

**Rectifier.**—A name sometimes given to a commutator.

**Rectilinear Co-Ordinates.**—Co-ordinates measured from two rectilinear axes intersecting in the plane of delineation at a point called the origin.

**Rectilinear Current.**—A current flowing through a straight or rectilinear portion of a circuit.

**Rectifying Commutator.**—A term sometimes applied to a commutator which commutes alternating into direct currents.

**Red Candle.**—A photometric candle employed in connection with a red glass screen, for the purpose of enabling the unpracticed eye to more readily compare it with the source whose intensity is to be measured.

**Red Heat.** The temperature at which a body begins to glow or to emit red rays of light.

**Red Hot.**—Possessing the temperature of red heat.

**"Red" Magnetism.** A name formerly applied to the magnetism at the north pole of a magnet, as distinguished from the so-called "blue" magnetism at the south pole.

**Redressed.** A word sometimes employed for commuted.

**Redressed Currents.**—Commutated currents.

**Reduced Battery.** A portion only of a main-line battery employed in quadruplex telegraphy.

**Reduced Deflection Method.**—A method of measuring electromotive force, resistance or current, by determinations based upon an observed reduction in current strength, and resulting deflection of a galvanometer in the circuit.

**Reducing Clamp for Underground Tubing.**—A clamp at a coupling box clamping an underground tube, of such dimensions as to permit of a change in the diameter of the next succeeding tube.

**Reducing Coupling.**—A flexible coupling connecting two conductors of different diameters.

**Reducing Switch.**—A switch so connected with a circuit as to bring a reduced or lowered pressure upon a sub-circuit.

**Reducteur Resistance for Volt Meter.** (1) A coil of known resistance as compared with the resistance of the coils of a voltmeter, that is connected with them in series for the purpose of increasing the range of the instrument. (2) A multiplying coil, or multiplier of a voltmeter.

**Reducteur Shunt for Ammeter.**—(1) A shunt coil connected in multiple with the coils of an ammeter for the purpose of changing the value of its readings. (2) A multiplier.

**Reduction Factor of Galvanometer.**—The ratio between the horizontal intensity of the field of a galvanometer and the galvanometer constant.



**Reduction Gear.**—Gear employed on a street-car for suitably reducing the speed of the car below that of the motor which drives it.

**Reed Interrupter.**—A form of automatic make-and-break contact, operated by the vibrations of a reed.

**Reel Insulator.**—An insulator resembling a reel in shape, and suitable for use in connection with an engine plane signal system.

**Re-Enforcement of Sound.**—An increase in the intensity of sound by the use of sounding boards, resonators, or reflectors.

**Re-Entrancy.**—The intersection of a curve by itself.

**Re-Entrancy of Armature Winding.**—The condition or property of an armature winding, by virtue of which the conducting path through the armature repeats itself or re-enters itself.

**Re-Entrant Armature Windings.**—Armature windings, which, when followed in either direction, lead back to the starting point.

**Refining, Electric.**—The refining of metals by the application of electrolysis.

**Reflect.**—To throw off from a surface according to the laws of reflection, as of waves in an elastic medium.

**Reflecting.**—Throwing off from a surface in accordance with the laws of reflection.

**Reflecting Galvanometer.**—A term sometimes applied to a mirror galvanometer.

**Reflection.**—The throwing back of a body or wave from a surface at an angle equal to that at which it strikes the surface.

**Reflection of Electro-Magnetic Waves.**—The reflection of electro-magnetic waves that occurs from the surfaces of certain substances placed in the path of the waves.

**Reflector.**—A reflecting surface suitably shaped to reflect rays of light in any desired direction.

**Reflector Bracket.**—A bracket for supporting two insulators and for holding the support of a street lamp, with or without a reflector.

**Reflector Search-Light.**—A search-light consisting of a focussing lamp placed at the focus of a suitable reflector.

**Reflector Shade.**—A shade surrounding an arc-lamp, a portion of whose surface is covered with reflecting material.

**Refract.**—To change the direction of waves in any elastic media in accordance with the laws of refraction.

**Refracting.**—Changing the direction of waves in elastic media in accordance with the laws of refraction.

**Refraction.**—The bending of a ray of light, heat, or electro-magnetism, at the interface of any two transparent media, whose elasticity and density differ.

**Refractive Energy.**—A value equal to the index of refraction minus unity.

**Refractory.**—(1) Possessing the power of resisting fusion by heat. (2) Fusible only at extraordinarily high temperatures.

**Refreshing Action of Current.**—The restoration, after fatigue, of muscular and nervous excitability obtained by the action of voltaic alternatives.

**Regenerable Cell.**—A regenerative cell.

**Regenerated Cell.**—A cell which has had its ability for producing current restored by a charging process.

**Regenerative Armature.**—A word proposed for the armature of a dynamo that is capable of producing its own magnetic field flux, when commuted with a backward lead.

**Regenerative Cell.**—(1) A name sometimes given to an early form of storage cell. (2) Any cell which can have its energy restored by the action of a charging current.

**Regional Magnetic Disturbances.**—A term proposed for magnetic disturbances that are apparently confined to limited regions of the earth's surface.

**Register.**—A word frequently employed for any registering apparatus.

**Registering Apparatus, Electric.**—Devices for obtaining permanent records by electrical means.

**Registering Declination-Magnetometer.**—A magnetometer employed for automatically registering the magnetic declination.

**Registering Electrometer.**—An electrometer whose indications are automatically registered.

**Registering Photometer.**—(1) A photometer which registers not the photometric but the actinic or chemical action of light. (2) A recording photometer.

**Regulating Box.**—(1) A rheostat inserted in the field circuit of a generator or motor for regulating the current passing through the field-magnet coils. (2) A rheostat.

**Regulating Cell for Storage Battery.**—A counter-electromotive force cell.

**Regulating Lamp-Socket.**—(1) A lamp socket containing a device controlled by

a key or switch for regulating the degree of luminousness of the filament. (2) A general term for any form of lamp socket which will permit the light to be economically turned down or lowered in intensity.

**Regulating Wire.**—Adjusting the tension of overhead line wires.

**Regulation of Dynamo.**—Such an adjustment of a dynamo as will preserve constant either its current or its pressure.

**Regulation of Motor.**—Such an adjustment of a motor as will preserve constant its speed, or its torque, or both.

**Regulator for Dynamo.**—Any device by means of which the regulation of a dynamo is effected.

**Regulator for Motor.**—Any device by means of which the regulation of a motor is effected.

**Regulator Magnet.**—(1) A magnet whose function is to automatically effect any desired regulation. (2) In a system of automatic constant-current dynamo-regulation, the magnet by the movements of whose armature the commutator brushes are automatically shifted to such positions on the commutator as will maintain the current practically constant, despite changes in the resistance of the circuit external to the machine.

**Reguline Electro-Metallurgical Deposit.**—A flexible, adherent and strongly coherent film of electrolytically deposited metal.

**Regeneration of Luminescence.**—Re-imparting, by exposure to light or other suitable means, the power of luminescence to a substance after it has lost this power.

**Relative Inductivity.**—The ratio of the inductivity of a medium to the inductivity of vacuum.

**Relative Permittivity.**—The ratio of the permittivity of a medium to the permittivity of vacuum.

**Relaxation Distance.**—The distance in which an electro-magnetic wave travelling along the surface of a conductor, diminishes in amplitude in a ratio whose Neperian logarithm is unity.

**Relaxation Time.**—The time during which a homogeneous distribution of electric charge diminishes to a ratio whose Neperian logarithm is unity.

**Relay** is equivalent to electro-magnetic power, and with various forms related to a different apparatus structure the more-

ments of which open or close a local receiver circuit.

**Relay Bell.**—A electric bell in which a relay magnet is employed to switch a local battery into the circuit of the bell.

**Relay Contact.**—A term frequently applied to a form of electro-magnetic instrument by means of which a local circuit is completed on the passage of a current. (2) The contact point of a relay.

**Relay Magnet.**—A term sometimes given to a relay. (2) The permanent magnet of a polarized relay. (3) The electro-magnet of a relay.

**Relief Lamp.**—(1) An incandescent lamp whose socket is provided with a spring cut-out, so arranged that on the breaking of the lamp the circuit is automatically closed. (2) An incandescent lamp held in reserve for insertion in a series system to take the place of a lamp that has been cut out.

**Relief Operators.**—In telegraphy or telephony, operators coming on duty to relieve the operators at work.

**Relief Photometer.**—The name given to a class of photometers in which the two divisions of the screen are not placed in the same plane but at right angles to each other, the quality of the illumination being readily determined since the whole screen then appears as a single plane illuminated surface, in which the edge of a dihedral angle of the screen is no longer perceptible.

**Relievo.**—(1) The opposite of intaglio. (2) A stone, electro, or other solid body, in which a figure is so represented that its outlines project or stand out from the surface.

**Reluctance.**—(1) A term applied to magnetic resistance. (2) In a magnetic circuit the ratio of the M. M. F. to the total magnetic flux.

**Reluctancy.**—A term proposed for reluctance.

**Reluctivity.**—The specific magnetic resistance of a medium.

**Reluctivity Constants.**—The constants which, when applied according to a formula to the magnetic force or magnetic flux density in iron or steel, give the inductivity of the iron or steel.

**Remaining Sockets.**—The sockets of multiple telegraphic systems in which will act particular sockets.

**Remanence.**—A magnetic remanence. (2) The intensity of magnetic induction or residual flux of their magnetization curves. (3) The magnetic flux

density in a magnetic substance when the magnetic force is reduced to zero.

**Remanent Flux.**—Remanent magnetism.

**Remanent Magnetism.**—A phrase sometimes used in place of residual magnetism.

**Remanent Polarization.**—(1) A term proposed to describe the condition of a voltmeter when a certain number of discharges having traversed it, all in the same direction, and a series of discharges exactly equal to the preceding have been established in the opposite direction, the currents of polarization are less intense in the second than in the first. (2) Residual polarization of immersed electrodes after a passage of the current.

**Removable Key-Switch.**—A plug switch.

**Removable Pole-Step.**—A pole step capable of being inserted into and removed from a socket for the equipment of a lineman, to enable a lineman to reach the permanent steps.

**Renovation of Secondary or Storage Cell.**—The recharging of a run-down or discharged storage cell.

**Renter.**—A term sometimes used for subscriber.

**Reoforo.**—A rheophore.

**Repair-Wagon for Trolley Line.**—A wagon provided with a tower or telescopic support employed for the repair of trolley lines.

**Repeater.**—The name sometimes given to a telegraphic repeater, or translator.

**Repeating Relay.**—(1) A relay employed in a repeater. (2) The relay in a telegraph circuit which repeats the signals into another circuit.

**Repeating Sounder.**—A telegraphic sounder which repeats a telegraphic dispatch into another circuit.

**Repeating Telegraphic Station.**—A station situated at some intermediate point on a long telegraphic line which is divided into sections, where the currents received on one section are passed through a repeater by means of which they are sent on or repeated into the other section.

**Repeating Telephone Coil.**—An induction coil provided with two windings, usually of an equal number of turns, each winding being connected to a telephone circuit, so that the two circuits are placed in intimate inductive association.

**Replomasher.**—A static influence machine employed for charging a quadrant electrometer or other electrostatic device.

**Repulsion, Electric.**—The mutual driving apart, or tendency to mutually drive apart, which exists between two similarly charged bodies, or between two similar electric charges.

**Repulsion Electrometer.**—An electrometer in which the differences of potential are measured by means of the repulsion existing between two similarly charged bodies.

**Repulsion Motor.**—(1) An electric motor deriving its power from the repulsion between electric charges. (2) An alternating-current motor deriving its power from the repulsion between electric currents. (3) An alternating-current motor in which the armature is provided with temporarily short-circuited windings by means of a commutator and brushes.

**Reserve-Cell Switch.**—A switch employed in a storage-battery installation for the purpose of maintaining the pressure of discharge by introducing reserve cells into the circuit.

**Residual Atmosphere.**—The traces of air or other gas remaining in a space which has been nearly exhausted of its gaseous contents by a pump or other means.

**Residual Charge.**—The charge remaining in a Leyden jar after it has been disruptively discharged.

**Residual Flux.**—Residual magnetic flux.

**Residual Magnetic-Flux.**—(1) Remanence. (2) Magnetic flux remaining in a magnetic circuit by virtue of hysteresis after the withdrawal of the magnetizing force.

**Residual Magnetism.**—(1) The magnetism remaining in a core of an electromagnet on the opening of the magnetizing circuit. (2) The small amount of magnetism retained by soft iron when removed from any magnetic flux.

**Residue, Electric.**—A term proposed for residual charge.

**Resilience.**—(1) A word sometimes employed for elasticity. (2) The work done in deforming a bar up to the elastic limit.

**Resin.**—A general term applied to a variety of dried juices of vegetable origin.

**Resinous Electricity.**—A term formerly employed in place of negative electricity.

**Resinous Electrification.**—A name formerly applied to an electrification produced in resin by its friction.

**Resistance.**—(1) A word sometimes used for electric resistance. (2) Obstruction to flow. (3) Obstruction to force.

**Resistance Balance.**—A duplex or quadruplex balance adjusted for the resistance of a line by means of a rheostat.

**Resistance Balance of Duplex System.**

(1) A balance obtained in a duplex system by inserting in the artificial line a resistance corresponding to that of the sum of the resistances of the main line wire, the distant relays, and the distant battery. (2) A balance of resistance in duplex telegraphy as opposed to a balance of capacity.

**Resistance Board.**—A general term for a board on which resistances are so placed as to be capable of ready adjustment, connection, introduction, or removal from a circuit.

**Resistance Box.**—A term employed for a box containing graduated resistance coils.

**Resistance Bridge.**—A name frequently employed for a Wheatstone's resistance balance.

**Resistance Bridge-Box.**—A box form of Wheatstone's bridge.

**Resistance Coefficient.**—The resistance factor.

**Resistance Coil.**—(1) A coil of wire, strip, or conductor, possessing electric resistance. (2) A coil of wire, of known electric resistance, employed for measuring an unknown electric resistance.

**Resistance Column.**—A name given to a particular form of resistance coil or rheostat.

**Resistance Conductivity.**—The resistance offered by a substance to electric conduction, or to the passage of electricity through its mass.

**Resistance, Electric.**—(1) The ratio between the electromotive force of a circuit and the current that passes therein. (2) The reciprocal of electric conductance.

**Resistance Factor.**—The coefficient of frictional resistance to the movements of a suspended or oscillatory system.

**Resistance Losses.**—(1) Losses in any system for the transmission or the transference of energy occasioned by friction. (2) Losses in an electrical distribution system due to resistance.

**Resistance of Human Body, Electric.**—The ohmic resistance which the human body offers to the passage of an electric discharge or current.

**Resistance of Human Skin, Electric.**—The ohmic resistance of the skin.

**Resistance of Liquid, Electric.**—The ohmic resistance of a mass of liquid.

**Resistance of Telegraphic Leak.**—The resistance offered by a leak in a telegraphic line or circuit.

**Resistance of Voltaic Arc.**—Resistance offered by a voltaic arc to the passage of a current.

**Resistance Slide.**—(1) A rheostat in which the separate resistances or coils are placed in or removed from a circuit by means of a sliding contact or key. (2) Apparatus employed in telegraphy for charging a conductor to a given fraction of the maximum potential of a battery, so as to adjust its charge in order to balance the varying charge of the cable. (3) A set of coils by which a potential difference applied to the terminals is virtually divided into 10,000 parts, so that any ratio may be instantly selected.

**Resistance Thermometer, Electric.**—A thermometer whose indications are based on the change in the electric resistance of a metallic substance with changes of temperature.

**Resistance to Shearing.**—The quotient of the shearing stress by the shear produced.

**Resistants.**—Bodies possessing the power of resistance.

**Resistor.**—A name sometimes given to a float or buoy connected with a cable while it is being paid out, in order to diminish the risk of injury from tension.

**Resisting Torque.**—(1) The torque which it is necessary to give to a motor in order to enable it to move. (2) The torque of retarding or opposing forces.

**Resistive.**—(1) Possessing the property of resistance. (2) Offering resistance.

**Resistivity.**—(1) The specific resistance of a substance referred to the resistance of a cube of unit volume. (2) Specific resistance, or the inverse of specific conductivity. (3) A quantity in the C. G. S. electro-magnetic system represented dimensionally in square centimetres per second.

**Resolution of Force.**—The separation of a single force acting with a given intensity in a given direction, into a number of separate forces acting in other directions.

**Resonance.**—(1) In a simple-harmonic current, circuit, or branch, containing both inductance and capacity, the neutralization or annulment of inductance-reactance by capacity reactance, whereby the impedance of the circuit or branch is reduced to the ohmic resistance. (2) In an alternat-



ing-current circuit, or branch, containing localized inductance and capacity, the reinforcement of condenser pressure, inductance pressure, or current strength, due to the mutual neutralization or opposition of inductance and capacity-reactances. (3) In an alternating-current circuit, or branch, the attainment of a circuit containing a condenser to the same natural undamped frequency of oscillation as the frequency of impressed E. M. F. whereby the circuit responds to this frequency more than to any other. (4) In an alternating-current circuit, or branch, the annullment of inductance-reactance by capacity-reactance, whereby the impedance of the circuit or branch is not only reduced to its ohmic resistance, but its current is in phase with its impressed E. M. F. (5) In a secondary alternating-current circuit containing localized inductance and reactance, the attainment of the natural undamped frequency of oscillation to the frequency of the pressure impressed upon the primary circuit, whereby the secondary impedance is reduced to its ohmic resistance, the secondary current is a maximum for any given primary current strength, and the secondary current is in phase with the induced secondary E. M. F.

**Resonant Capacity.**—The capacity of a resonant circuit, or such a capacity as will render an alternating-current circuit resonant.

**Resonant Circuit.**—(1) A circuit whose dimensions are such as to bring it into resonance with a neighboring circuit. (2) A circuit containing distributed inductance and capacity, in which resonant effects are thereby produced.

**Resonant Inductance.**—The inductance of a resonant circuit, or the inductance which will render it resonant.

**Resonant Rise of Potential.**—A rise of potential in a circuit due to its resonance.

**Resonator, Electric.**—(1) An open-circuited conductor whose dimensions are such that electro-magnetic waves or pulses are propagated through it at the same rate as they are taking place in a neighboring circuit, and which, consequently, has electro-magnetic pulses set up sympathetically in it by resonance. (2) A circuit tuned to oscillate in synchronism with another oscillating or alternating circuit.

**Rest.**—(1) Freedom from motion. (2) The condition of a body in which it maintains an unchanged relative position with respect to neighboring bodies.

**Restoring-Coil Battery.**—In a telephone exchange the battery which operates the self-restoring annunciators.

**Restoring-Coil Circuit.**—In a telephone switchboard, the local circuit of the coil of a self-restoring annunciator.

**Restored Cell.**—A charged storage cell.

**Resultant.**—In mechanics, a single force that represents in direction and intensity the effects of two or more separate forces.

**Resultant Fault.**—The apparent position and magnitude of a fault in a cable due to the resultant of all its leakage, or faults compounded by the rules of parallel forces, or as represented by finding the centre of gravity of an unequally loaded rod.

**Resultant Induction.**—The magnetic induction in an armature of a dynamo or other magnetized body which is the resultant of several components of magnetic induction.

**Resultant Magnetic Field.**—A single magnetic field produced by two or more co-existing magnetic fields.

**Resultant Magnetic Field of Dynamo.**—The magnetic field which is the result of both the field due to the field magnets and to the current passing through the armature coils.

**Resultant Magnetic Pole.**—A term sometimes employed for a consequent pole.

**Resultant Reactance.**—The total reactance in a circuit or conductor.

**Resuscitating Power of Secondary or Storage Cell.**—The ability possessed by a storage cell to regain its normal condition under the influence of the charging current.

**Retardance.**—In a telephone circuit, a quantity alleged to represent the limitation of the circuit in regard to the transmission of speech, and equal to the product of the total capacity of the line and the total ohmic resistance.

**Retarding Coil.**—A choking coil.

**Retarding Disc.**—A copper disc supported on a rotating shaft so placed as to cut magnetic flux, and be thereby retarded in its speed of rotation.

**Retardation.**—A decrease in the speed of telegraphic signalling caused by distributed electrostatic induction and resistance.

**Retardation Coil.**—(1) A term sometimes used for choking coil. (2) An induction coil. (3) A retarding coil.

**Retardation, Electric.**—A retardation in

the starting or stopping of an electric current due to self-induction.

**Retarded Quadrature.**—In a simple harmonic-current circuit the condition of lagging in quadrature, or of phase difference amounting to 90° in lag.

**Retentiveness.**—Possessing the property of retentivity.

**Retentivity.**—Possessing the power of retaining magnetization or of resisting demagnetization.

**Retort Carbon.**—Carbon obtained from a deposit on the interior of a gas retort, and formerly used for the production of arc-light carbons.

**Return-Call Annunciator.**—An annunciator connected with an answering call-box for showing that a call sent out has been received at the central station.

**Return Charge.**—(1) A charge produced by an oscillatory return or back stroke of lightning. (2) A charge produced inductively by a lightning discharge.

**Return Circuit.** That part of a circuit by which an electric current returns to the source.

**Return Conductor.**—The return wire.

**Return Current.** In telegraphy the electrostatic discharge from a cable or underground wire.

**Return Current.**—The discharge current from a telegraph line passing to ground at the sending end.

**Return Feeders.**—(1) The feeders through which a current returns to a central station. (2) Negative feeders. (3) The feeders connected with the track in a trolley system. (4) Ground feeders.

**Return Feeders for Railway Circuits.** Copper conductors employed in railway circuits for re-enforcing ground-return circuits, and usually insulated.

**Return Ground.**—(1) That part of the ground employed as a return. (2) The ground-return.

**Return-Signal Call-Box.**—An answering call-box.

**Return Stroke of Lightning.**—An electric discharge induced by the direct discharge of a lightning flash, as distinguished from the direct discharge itself.

**Return-Track Feeder.**—A feeder in a trolley system connected to the track.

**Return Wire.**—The wire or conductor by means of which the current returns to the electric source after having passed through the electro-receptive devices.

**Returns.**—In a system of distribution, those conductors through which the cur-

rent flows back from the electro-receptive devices to the sources.

**Reversal.**—(1) A change in direction. (2) A semi-wave.

**Reversal of Phase.**—A change in the phase of a current due either to the reversal of the current or of the conductor in which it is produced.

**Reversals.**—In telegraphy, alternate-current signals transmitted for the purpose of adjustment or for clearing the line of a charge.

**Reverse-Current Working.**—Telegraphic transmission by means of reverse currents, or double currents.

**Reverse Currents.**—(1) A name sometimes applied to alternating currents. (2) A name sometimes applied to double currents.

**Reverse-Induced Current.**—(1) The current induced by a current in its own circuit at the moment of making or closing the circuit. (2) The current induced in a secondary circuit on making or closing a primary circuit.

**Reverser.**—Any device for reversing or changing the direction of a current.

**Reversor Bars.** The commutator connection employed in Saver's armature winding which carries the current during the short time that the corresponding sections are passing under the brushes.

**Reversible Bridge.** A bridge or balance so arranged that the proportionate coils can be readily interchanged, thus permitting the bridge coils to be readily tested by reversing.

**Reversible Electric Motor.**—(1) A motor whose direction of motion is readily reversed. (2) A motor which is so arranged as to be readily operated as a generator.

**Reversible Heat.**—The heat produced in a heterogeneous conductor by the passage through it of an electric current.

**Reversible Heating Effect of Electricity.**—A term sometimes employed in place of the Peltier effect.

**Reversible Regenerative Armature.**—A regenerative armature that is capable of generating electromotive force when the direction of its rotation is reversed.

**Reversibility of Dynamo.**—The ability of a dynamo to operate as a motor when traversed by an electric current.

**Reversing.**—Changing any direction to its opposite.

**Reversing a Current.**—Changing the direction of a current.

**Reversing Cell.**—A voltaic cell whose couple and electrolyte are contained in a hermetically closed vessel so arranged that when the cell is placed in one position the electrolyte does not touch the couple, and when reversed the electrolyte surrounds the couple.

**Reversing Controlling-Box.**—A motor controlling-box which enables the direction of rotation of the motor to be reversed.

**Reversing Cylinder.**—(1) The cylinder in a motor controlling apparatus carrying the reversing contacts. (2) The contact cylinder of a reversing switch.

**Reversing-Gear of Electric Motor.**—Apparatus for obtaining a reversal in the direction of rotation of a motor.

**Reversing-Handle of Car Controller.**—(1) A switch handle placed on a car controller for the purpose of changing its direction of motion. (2) The handle of an emergency switch in a street-car controller.

**Reversing Key.**—(1) A key inserted in the circuit of a galvanometer for obtaining deflections of the needle on either side of the galvanometer scale. (2) A key which serves to reverse the current supplied to a circuit.

**Reversing Key of Quadruplex Telegraphic System.**—The key in a quadruplex system which reverses the direction of the current and so operates one of the distant instruments.

**Reversing Magnetic-Field.**—That portion of the field of a dynamo produced by the field-magnet coils, in which the currents flowing in the armature coils are stopped or reversed after the coil has passed its theoretical position of neutrality.

**Reversing Switch.**—A switch employed in reversing a circuit or current.

**Revolving Primary of Induction Motor.**—(1) A rotor primary. (2) In an induction motor, a revolving element connected with the line.

**Revolving System.**—The twist system of erecting telegraph or telephone wires, so as to avoid induction.

**Rheocord.** A word formerly employed for rheostat. (Obsolete.)

**Rheometer.**—A word formerly employed for any device for measuring the strength of a current. (Obsolete.)

**Rheomotor.**—A word formerly employed to designate any electric source. (Obsolete.)

**Rheophore.**—A word formerly employed

to indicate a portion of a circuit conveying a current and capable of deflecting a magnetic needle placed near it. (Obsolete.)

**Rheoscope.**—A word formerly employed in place of galvanoscope. (Obsolete.)

**Rheoscopic Limb.**—A word sometimes employed for a physiological rheoscope, such as the galvanoscopic frog.

**Rheostat.**—An adjustable resistance.

**Rheostat Frame.**—A perforated frame or casing in which the separate resistances of a rheostat are placed.

**Rheostat Handle of Car-Controller.**—The main switch of a car-controller.

**Rheostat Panel.**—A panel in any switch-board to which the rheostat circuits are connected.

**Rheostatic Machine.**—A machine devised by Planté in which continuous static effects of considerable intensity are obtained by charging a number of condensers from storage cells connected in multiple-arc, and then discharging the condensers in series.

**Rheotome.**—A word formerly employed for interrupter. (Obsolete.)

**Rheotometer.**—A compound bridge and rheostat.

**Rheotrope.**—A word formerly employed for commutator or current reverser.

**Rhigolene.**—A highly volatile hydrocarbon obtained during the distillation of coal-oil, and sometimes employed in the flashing treatment of incandescent lamp filaments.

**Rhumbs of Compass.**—The points of a mariner's compass.

**Ribbed Armature-Core.**—A cylindrical armature core provided with longitudinal projections or ribs which serve as grooves for the reception of the armature coils.

**Ribbon Conductor.**—A flat, ribbon-shaped conductor.

**Ribbon Copper.**—A copper strip or ribbon-shaped copper conductor.

**Ribbon Core.**—A form of laminated core made by iron ribbons.

**Ribbon Fuse.**—A fuse in the shape of a ribbon.

**Ribbon Induction-Coil.**—An induction-coil whose primary and secondary circuits are formed of metallic ribbons instead of wires.

**Ribbon Vibrator.**—An electro-magnetic contact-breaker consisting of a horizontal steel ribbon, the rate of vibration of



which can be varied by varying its tension.

**Right-Angled Trolley-Crossing.**—A trolley crossing placed at a point where two streets intersect at right angles.

**Right-Hand Trolley-Frog.**—A trolley frog used at a point where a branched trolley wire leaves the main line on the right hand in the direction of advance.

**Right-Hand Trolley-Switch.**—A term sometimes used for a right-hand trolley frog.

**Right-Handed Armature Winding.**—An armature winding applied to the core in a right-handed or dextrorsal helix.

**Right-Handed Dynamo.**—A dynamo whose proper direction of rotation is right-handed regarded from the pulley end.

**Right-Handed Helix.**—(1) A right-handed solenoid. (2) A helix wound right-handedly when regarded from either end.

**Right-Handed Motor.**—A motor arranged to run right-handedly or clockwise when regarded from the pulley end.

**Right-Handed Rotation.**—(1) A direction of rotation which is the same as that of the hands of a watch, when one looks directly at the face of the watch. (2) Negative rotation.

**Right-Handed Solenoid.**—A dextrorsal solenoid or one whose winding is right-handed.

**Right-Handed Spiral.**—A term sometimes used for right-handed solenoid.

**Right-Handed Winding.**—A winding applied in a right-handed direction.

**Ring Armature.**—An armature provided with a ring-shaped core.

**Ring-Armature Core.**—A ring-shaped armature core.

**Ring Clutch.**—A form of clutch employed for gripping the lamp rod of an arc-lamp when slightly moved from a horizontal position.

**Ring Clutch for Arc-Lamp.**—A ring-shaped clutch embracing the lamp rod, which grips or holds the rod when tilted or inclined, but permits it to fall when in a horizontal position.

**Ring-Connected Armature.**—An armature provided with ring connections.

**Ring-Connected Generator.**—A generator provided with an armature winding, in which corresponding points are connected to ring conductors for the purpose of equalizing the magnetic flux and the current distribution around the armature.

**Ring Connections of Armature.**—Conductors in the form of rings in a multipolar armature to each of which are connected corresponding points of the armature winding for the purpose of equalizing the current and magnetic flux in the machine.

**Ring Core.**—A ring-armature core.

**Ring Current of Triphase System.**—The current flowing between adjacent wires or terminals of a triphase system.

**Ring Magnet.**—A uniformly magnetized rod bent into a closed ring.

**Ring Main.**—A ring-shaped distributing main.

**Ring-Off.**—A term employed for a signal sent by a telephone correspondent when the conversation is finished.

**Ring-Off Drop.**—(1) A telephone drop released by a ring-off signal. (2) A drop placed at a central telephone station and operated by a subscriber when he rings off or hangs up his telephone.

**Ring-Off Signal.**—A signal given by a subscriber at the close of his conversation, to inform the central station that the connection may be discontinued.

**Ring-Off Telephone-Indicator.**—Any indicator on a telephone switchboard that is operated by a ring-off signal.

**Ring Potential of Triphase System.**—The effective difference of potential or voltmeter pressure between adjacent lines or terminals of a triphase system.

**Ring-Up.**—(1) In telephony, to actuate the call-bell of a subscriber wanted. (2) To call up an operator at an exchange or a distant subscriber.

**Ring Windings.**—Windings suitable for use in a ring-wound armature.

**Ring-Wound Armature.**—An armature consisting of a ring core with coils of wire wound thereon.

**Ringer.**—A telephone magnet.

**Ringer Coils.** The coils or winding of a telephone magneto.

**Ringer Magnet.**—A permanent magnet employed in a telephone magneto or ringer.

**Ringing Keys.**—In a telephone switchboard, keys for closing a generator upon a subscriber's circuit to ring his bell.

**Ringing Key.**—In a telephone switchboard, a key employed to ring up a subscriber.

**Ringing Key-Bars.**—In a telephone switchboard, metallic bars connecting the ringing keys with the instrument bars and generator.



**Rings, Electric.**—A term sometimes used instead of Nobili's rings.

**Ripple Marks, Electric.**—Wave marks produced in a fine powder by a neighboring Leyden-jar discharge.

**Risers.** (1) Supply wires which lead the current from the service wires to the different floors of a building. (2) The supply wires which rise to the various floors, as distinguished from floor mains, submains, or branches, which run along each floor.

**River Cable.**—(1) A cable suitable for use in a river. (2) A form of sub-aqueous cable.

**Riveted Railway-Joint.**—A rail-bond in which the connection between two contiguous rails is obtained by riveting specially heavy fish-plates to each end of the rail.

**Riveting Apparatus, Electric.**—A riveting apparatus employing electrically generated heat.

**Roaring of Arc.**—A roaring sound attending the formation of a powerful voltaic arc when the carbons are too near together.

**Rock-Drill, Electric.**—An electrically operated rock-drill.

**Rocker Arm.**—An arm on which the brushes of a dynamo or motor are mounted for the purpose of shifting their position on the commutator.

**Rocker-Arm Circle.**—The frame of a dynamo electric machine which supports the brush arms and is capable of adjustment in angular position.

**Rocking Switch.**—An automatic throw-over switch.

**Rod Clamp.**—A clamp employed in the lamp-rod of an arc-lamp.

**Rod Clutch.**—The clutch employed for gripping an arc-lamp rod.

**Rod Switch.**—A switch provided for lighting and extinguishing a lamp, so arranged that it can readily be pushed to its off or on position by means of a rod.

**Rodding a Conduit.**—The process of introducing a drawing-in wire through the ducts of an underground conduit by pushing a number of short sections of jointed rods through such ducts.

**Roentgen Effects.** The peculiar effects produced by Roentgen or X-rays.

**Roentgen Ether Waves.**—A term sometimes employed for Roentgen rays.

**Roentgen Radiograph.**—A word proposed for radiograph.

**Roentgen-Ray Picture.**—A word proposed for radiograph.

**Roentgen-Ray Screen.**—(1) A screen covered with fluorescent material intended to receive a visible Roentgen picture. (2) A fluoroscopic screen.

**Roentgen Ray Transformer.**—An alternating-current transformer suitable for operating a Roentgen ray tube.

**Roentgen-Ray Tube.**—A vacuum tube for the production of Roentgen rays, or X-rays.

**Roentgen Rays.**—A peculiar radiation emitted in the neighborhood of that portion of a high vacuum tube on which the cathode rays fall.

**Roentgen Shadow Print.**—A radiograph.

**Roentgen Streams.**—(1) Roentgen or X-rays. (2) A term applied to the Roentgen rays, by those who regard them as consisting of actual streams of matter thrown off, either from the cathode, or from the residual atmosphere of the vacuum tube.

**Roentgen Tube.**—Any high-vacuum tube capable of producing Roentgen rays.

**Roentgenogram.**—A word proposed for radiograph.

**Roentgenograph.**—A word proposed for radiograph.

**Rogot's Spiral.**—(1) A spiral, helix or solenoid, freely suspended at its upper end so that its lower end shall dip in a mercury surface, which when traversed by a sufficiently powerful current will break its own circuit by the attraction produced by its adjacent convolutions when by its weight it will complete the circuit, and thus be alternately opened and closed. (2) A form of automatic contact-breaker.

**Roman Vitriol.**—A name formerly applied to blue-stone or copper sulphate.

**Rontgram.**—A word proposed for radiograph.

**Rontgraph.**—A word proposed for radiograph.

**Rontgraphy.**—A word proposed for radiography.

**Roof Box of Push.**—A term sometimes employed for the upper covering of the box of a push-button.

**Roof Bracket.**—(1) An insulator bracket, either straight or offset for attachment to a roof. (2) A form of house fixture provided for the support of overhead wires.

**Roof Standard.**—A form of house fixture provided for overhead wires.

**Room Call, Electric.**—Any device placed in the room of a hotel for the purpose of automatically sending calls to the office.

**Rope Transmission.**—Transmission of power by means of ropes or cables.

**Rosette.**—(1) An ornamental plate provided with service wires and placed in a wall or ceiling for the ready attachment of an electric lamp or electrolier. (2) A word sometimes used in place of ceiling rose.

**Rosette Cut-Out.**—A rosette for an electrolier, provided with a cut-out.

**Rotary Converter.**—A secondary generator for transforming alternating into continuous currents or vice-versa, consisting of an alternating-current machine whose armature winding is connected with a commutator; or of a continuous-current machine, whose armature is tapped at symmetrical points and connected to collector rings; so that, when the armature runs it is an alternator on one side and a direct current machine on the other. (2) A rotary transformer.

**Rotary Current.**—(1) A name applied to any system of polyphase currents which are capable of producing a rotary field. (2) A rotating-current distribution.

**Rotary-Current Transformer.**—A transformer capable of being operated by a rotary current.

**Rotary Electric Field.**—A rotary electrostatic field.

**Rotary Electro-Type.**—(1) A term sometimes used for a turtl-hack. (2) Any electro-type with a curved surface suitable for printing in a cylinder press.

**Rotary-Field Induction-Motor.**—An induction motor operated by a rotary field.

**Rotary-Field Motor.**—A rotary-field induction-motor.

**Rotary Induction Transformer.**—A rotary-current transformer.

**Rotary-Magnetic Field.**—(1) A field produced by a rotary current. (2) A magnetic field in which a set of magnet poles is produced, whose successive positions are such that a rotation of the field is effected.

**Rotary-Magnetic Polarization.**—The rotation of the plane of polarization of a beam of plane-polarized light, consequent on its passage through a medium subjected to the stress of a magnetic field.

**Rotary Magnetism.**—The magnetism produced by a rotary magnetic field.

**Rotary-Phase Alternating-Currents.**—Rotary-phase currents.

**Rotary-Phase Currents.**—A term sometimes employed for a rotating electric current distribution.

**Rotary-Phase Dynamo.**—A term sometimes employed for a rotating-current dynamo.

**Rotary Transformer.**—(1) A term generally employed for the combination of a motor and generator in one machine having a single armature-winding traversed both by alternating and continuous currents. (2) A secondary generator for transforming from alternating to continuous currents or vice-versa. (3) A rotary converter.

**Rotating Brushes of Dynamo.**—(1) Rotating discs of metal employed in place of the ordinary brushes for carrying off the current from the armature of a dynamo. (2) Brushes revolved around the periphery of a commutator.

**Rotating Current.**—(1) A term applied to the current which results by combining a number of alternating currents, whose phases are definitely displaced with respect to one another. (2) A polyphase or multiphase current.

**Rotating-Current Field.**—A magnetic field produced by a rotating current.

**Rotating-Current Motor.**—A motor operated by a rotating current.

**Rotating-Current Transformer.**—A rotary-current transformer.

**Rotating Transformer.**—(1) A rotary transformer. (2) An induction motor.

**Rotating Vector.**—A line or vector quantity which rotates about a fixed point.

**Rotometer.**—A form of cyclometer attached to a drum for measuring the amount of cable passing over the drum in picking up or paying out a submarine cable.

**Rotor.**—That portion of a dynamo-electric machine which rotates.

**Rotor Armature.**—An armature which rotates.

**Rotor Circuit.**—The circuit of a rotor.

**Rotor Coils.**—The coils placed on a rotor.

**Rotor Currents.**—The currents produced in the rotor coils.

**Rotor Field.**—The field of a rotor.

**Round Wire-Gauge.**—A wire gauge consisting of a circular plate provided on its circumference with slots of various sizes.

**Rubber of Electric Machine.**—That portion of a frictional machine which produces the electricity by rubbing against a disc or plate.

**Rubber Tape.**—A form of adhesive, insulating tape made of rubber.

**Rubbing Contact.**—A contact effected by means of a rubbing motion.

**Rubbing Contact Key.**—A key provided with a rubbing contact.

**Ruhmkorff Coil.**—(1) An early form of induction coil or step-up transformer. (2) An induction coil having an iron-wire core, and a fine wire secondary coil of many turns for the production of powerful induced E. M. F.'s, usually excited from a battery or continuous current source through a suitable current breaker.

**Ruhmkorff Commutator.**—A commutator employed in a Ruhmkorff coil for reversing the direction of the current through the primary.

**Rumble.**—A barrel, or hollow box, rotated by mechanical power, in which small articles are prepared for electro-plating by the polishing obtained by their attrition against one another, or against hard objects placed therein.

**Run-Down Cell.**—An exhausted cell.

**Running-Board.**—A device employed in the construction of a heavy overhead line,

consisting in placing a number of reels of wire, usually ten or more, on a spindle, and arranging a piece of wood as a cross-arm to which ten or more wires are attached, harnessing horses to the cross-piece, and then dragging the running board away as the wires are paid out from the reels, and passing them over their appropriate cross-arms, where they are at once secured to the insulators by line-men.

**Running Guard-Wire.**—A wire provided in a system of aerial trolley circuits, extending parallel to and immediately above the trolley wire, intended to intercept any wire falling on the line from above.

**Running Position of Street-Car Controller.**—A position of the switch-handle of a street-car controller at which current is supplied to the car-motors and they are kept in rotation, as distinguished from a position in which the current is cut-off.

**Running Rope.**—A rope attached to the running-board employed in the stringing of aerial wires.

**Running Torque of Motor.**—The torque exerted by a motor while running, as distinguished from the starting torque.

## S

**S.**—A contraction proposed for surface.

**S.**—A contraction proposed for second.

**s.**—An abbreviation for second, the C. G. S. unit of time.

**S. C.**—A contraction for secondary current.

**S. G.**—In submarine telegraphy, the prefix for a service message, or a message relating to the business of the company only.

**S. H. M.**—A contraction for simple-harmonic motion.

**S. P. D.**—A contraction for secondary potential difference.

**S. N. Code.**—A contraction for single-needle code.

**S. N. Telegraphic Instrument.**—A contraction employed for single-needle telegraphic instrument.

**S. P. Cut-Out.**—A contraction for single-pole cut-out.

**S. B. G.**—A contraction for standard railroad gauge or 4' 8½".

**S. W. G.**—A contraction for the British standard wire gauge.

**S. W. G.**—A contraction for Stubb's wire gauge.

**Saddle Bracket.**—A bracket holding an insulator and fastened to the top of a telegraph or telephone pole.

**Safe Alarm.**—An electro-magnetic alarm connected with a safe and assigned to give notice of an attempt to force the same.

**Safe Carrying Capacity of a Conductor.**—The maximum electric current a conductor will carry without becoming unduly heated.

**Safety Catch.**—A safety fuse.

**Safety-Catch Holder.**—A holder for a safety fuse.

**Safety Cut-Out.**—A safety fuse.

**Safety Device.**—Any device by means of which a circuit is automatically opened or short-circuited when the current passing through it exceeds certain pre-determined limits.

**Safety Device for Arc-Lamps or Series Circuit.**—Any mechanical device which automatically provides a path for a current around a lamp, or other faulty receptive device in a series circuit, and thus prevents the opening of the entire circuit on the failure of such device.



**Safety Device for Multiple Circuit.**—

- (1) A safety fuse. (2) A fuse wire or strip.  
(3) Any device for protecting a branch circuit, instrument or conductor from an excessive current.

**Safety Factor of Transformer.**—The ratio of the voltage with which a transformer has been tested, to the voltage at which it is operated.

**Safety Fuse.**—A wire, bar, plate or strip of readily fusible metal, capable of conducting, without fusing, the current ordinarily employed on the circuit, but which fuses and thus automatically breaks the circuit on the passage of an abnormally strong current.

**Safety Fuse-Block.**—A block provided for the reception of a safety fuse.

**Safety Lamp, Electric.**—(1) An incandescent lamp, provided with thoroughly insulated leads, employed in mines or other similar places, where the explosive effects of readily ignited substances are to be feared. (2) A portable electric incandescent lamp and battery for use in mines where explosive gases may be found.

**Safety Link.**—A link-shaped safety-fuse.

**Safety Plug.** (1) A safety fuse. (2) An insulating screw-plug containing a safety fuse, which by its insertion in a suitably prepared socket, automatically closes the circuit through such fuse.

**Safety Strip.**—A strip of fusible metal employed as a safety fuse.

**Sag of Conductor or Line Wire.** The dip of an aerial wire or conductor, between two adjacent supports, due to its weight.

**Sag Error.**—(1) Any error in installing an aerial wire due to insufficient allowance for sag with change of temperature. (2) Any error in computing the length of an aerial wire due to insufficient allowance for sag.

**Saint Elmo's Fire.**—Tongues of faintly luminous flame which sometimes appear on the pointed ends of earth-connected bodies, such as the tops of church steeples, or the masts of ships.

**Salient Magnetic Poles.**—A term sometimes applied to the single poles located at the extremities of an anomalous magnet, in order to distinguish them from the double or consequent poles formed by the juxtaposition of two similar magnetic poles.

**Salinometer.**—A form of hydrometer suitable for measuring the density of a saline solution.

**Saline Creeping.**—The formation, by efflo-

rescence, of salts on the walls of a solid immersed in a saline solution.

**Saline Solution.**—A solution of a salt in a liquid.

**Sand-Barrel Setting for Pole.**—A stout barrel or cask, placed in the bottom of an excavation in a loose, sandy soil, as a pole foundation in which the butt of the pole is placed, and a firm loam or clay tightly packed into the barrel around the pole.

**Sand-Box for Electric Car.**—A box employed for holding sand, so arranged as to distribute it over a track as desired, for the purpose of increasing the friction.

**Sanding Device.**—A device employed for sprinkling sand over a car-track.

**Sandy Electro-Metallurgical Deposit.** A non-coherent electro-metallurgical deposit, which occurs when the current density exceeds its normal value.

**Sash Lines.**—Ropes employed in raising telegraph poles to the vertical position.

**Saturated Solution.**—A solution in which as much of the solid has been dissolved as the solvent will take at a given temperature.

**Saturating Flux.**—The flux required to produce magnetic saturation in any circuit.

**Saw, Electric.**—An electrically operated saw.

**Saw-Tooth Lightning-Arrestor.**—A name sometimes applied to a comb lightning-arrestor.

**Sayers Armature Winding.**—An armature winding provided with additional coils called commutator coils which are subjected to the influence of an auxiliary pole and which are introduced into the main circuit to obtain sparkless commutation.

**Scalar.**—The name given to a quantity which has no directive property, or which has numerical magnitude only, such as temperature, or energy, as distinguished from a vector quantity.

**Scalar Potential.**—A potential possessing magnitude and sign without direction, as distinguished from a vector potential which possesses both direction and magnitude.

**Scale Zero.**—(1) An instrument zero. (2) A zero selected at the zero mark of a scale.

**Scarf Joint of Conductors.**—A joint between the ends of conductors in which the ends are prepared by filing them diagonally, so that when laid together and soldered, the joint is cylindrical in shape.



presents no rough edge, and, unlike a butt joint, extends over an appreciable length.

**Schiseophone.**—An electro-mechanical appliance for detecting flaws or internal defects in rails or other metallic masses.

**Schweigger's Multiplier.**—A name formerly given to a coil consisting of a number of turns of insulated wire, provided for the purpose of increasing the strength of the magnetic field produced by an electric current, and so increasing the amount of its deflecting power on a magnetic needle.

**Sciagraph.**—A word proposed for radiograph.

**Sciagraphic Print.**—A word sometimes used for radiograph.

**Sciagraphy.**—A word proposed for radiography.

**Scintillating Jar.**—A Leyden jar whose coatings, instead of being formed of continuous sheets of tin-foil, are formed of small pieces, placed at regular intervals on the glass or dielectric, so as to leave a small space between them.

**Scratch Brush.**—A brush made of wires, or of stiff bristles, employed for cleansing the surfaces of metallic objects before subjecting them to the electro-plating process.

**Scratch Brushing.**—Cleansing the surfaces of articles to be electro-plated by friction with a scratch brush.

**Screen, Electric.**—A closed conductor placed over a body in order to protect or screen it from the effects of external electrostatic fields.

**Screening.**—Protecting a body from the effect of an electrostatic or electro-magnetic field by means of a screen.

**Screening Effect of Eddy Currents.**—A term sometimes used for the effect produced by eddy currents in a solid mass of iron or steel, of shielding the interior of the mass from an externally applied alternating magnetic field.

**Screw Block-Fuse.**—(1) A form of plug cut-out. (2) A screw-plug in a receptacle or block containing a fuse.

**Screw Cleat.**—A cleat provided with a screw for its ready attachment to wood-work.

**Sea Cell Test.**—In a sub-marine system of electric torpedoes, a circuit test by means of a single voltaic cell in which sea water is the electrolyte.

**Sea Telegraphy.**—(1) Submarine Tele-

graphy. (2) Telegraphy carried on at sea either between neighboring vessels or between different parts of the same vessel.

**Seal of Motor.**—A leaden seal placed on a meter, after it has been properly installed, for preventing its being tampered with.

**Sealing-In of Filament.**—Effecting a hermetical seal between the support of the filament of an incandescent lamp and the lamp chamber in which it is placed.

**Sealing-Off of Lamp Chamber.**—Hermetically closing a lamp chamber while it is connected with the pumps, by the fusing of the glass.

**Sealing Tools.**—Tools employed for placing a seal on a meter.

**Sealing Wires.**—Wires employed for forming part of the seal of a meter.

**Search-Light, Electric.**—A focussing arc light placed in front of a reflector or lens, for the purpose of obtaining an approximately parallel beam of light for lighting the surrounding space.

**Searching Coil.**—A term sometimes applied to an exploring coil.

**Secohm.**—(1) The practical unit of self-induction, or of inductance. (2) A length equal by definition to that of an earth quadrant, or very nearly  $10^9$  centimetres. (3) A henry.

**Secohmmeter.**—An apparatus for measuring the self-inductance, the mutual inductance, or the capacity of conductors.

**Secondary.**—A word frequently employed for the secondary coil of a transformer or induction coil.

**Secondary Accumulator.**—A storage-cell accumulator.

**Secondary Ampere-Turns.**—Ampere-turns in the secondary of a transformer or induction coil.

**Secondary Admittance.**—The admittance of a secondary circuit.

**Secondary Battery.**—A word frequently used for storage battery.

**Secondary Cell.**—A word frequently used for storage cell.

**Secondary Clock.**—Any clock in a system of time telegraphy that is controlled by a master clock.

**Secondary Coil of Transformer.**—(1) The coil of a transformer into which energy is transferred from the primary line and primary coil. (2) The secondary winding of a transformer or induction coil. (3) The driven coil of a transformer. (4) The coil in the external circuit of

which there is no directly impressed E. M. F.

**Secondary Currents.**—(1) The currents produced in the secondary of a transformer. (2) The currents produced by secondary batteries. (3) Currents in any secondary circuit.

**Secondary Electromotive Forces.**—A name sometimes given to the electromotive forces produced by a secondary cell or battery.

**Secondary Element of Induction Motor.** Those portions of an induction motor, closed upon themselves, in which currents are induced.

**Secondary Frequency of Induction Motor.**—The frequency of the alternating currents induced in the secondary circuits of an induction motor, comprising only a small fraction of the frequency in the primary circuit or circuits.

**Secondary Fuse-Box.**—A fuse-box placed in the secondary circuit of a transformer or induction coil.

**Secondary Generator.**—(1) A generator which is not a prime source of energy, but receives its energy from some other electrical circuit either at some intermittent period, as in the case of a storage cell, or continuously, as in the case of a transformer. (2) A term sometimes employed for transformer.

**Secondary Generator.**—A device employed in alternating-current circuits for obtaining the working pressure on one circuit by induction from a neighboring circuit.

**Secondary Impressed Electromotive Force.**—The E. M. F. impressed upon a secondary circuit, as distinguished from the E. M. F. that is active in producing current or the E. M. F. exerted in overcoming self-induction.

**Secondary Impedance.**—In a secondary circuit the impedance, either of part, or of all of the circuit.

**Secondary Movers.** The driven shafts or machines, as distinguished from the driving shafts or machines.

**Secondary Plate of Condenser.**—That plate of a condenser in which a charge is induced by the presence of a charge on the opposite plate.

**Secondary Primary.**—A winding on an induction coil intermediate between the secondary and primary windings, arranged with the aid of revolving contacts to serve in each cycle, first as a secondary, and next as a primary winding, for the purpose of reducing the sparking at the

contact wheel of the primary coil when excited from an incandescent-lighting continuous-current circuit.

**Secondary Resistance.**—The resistance of a secondary coil or circuit.

**Secondary Spiral of Induction Coil.**—A term sometimes employed for the secondary winding of an induction coil.

**Secondary Standard of Light.** Any standard of photometric intensity of light that is not a fundamental standard, but which is used as an intermediary standard, with reference to, a fundamental standard.

**Secret Telephone System.** A domestic telephone system arranged so that telephonic communication can be obtained between any two stations without being overheard by a person at any other station and without the aid of an attendant or exchange.

**Secretion Current.**—A current following electric stimulation of the secretory nerves.

**Section.**—(1) A part. (2) A cutting plane. (3) A graphical representation of the appearance that is, or would be, presented by a body when exposed at a cutting plane. (4) In a trolley system, a portion or length of trolley conductor insulated from adjacent portions.

**Section Box.**—In a trolley system a box containing the connection to a section and the switch by which it is connected to a feeder.

**Section Circuit-Breaker.**—A magnetic circuit-breaker controlling a trolley-wire section.

**Section of Multiple Switchboard.**—A complete division or reproducing unit of a switchboard, in which every jack appears once.

**Section of Switchboard.**—A term sometimes used for a panel or a part of a panel of a switchboard.

**Section Insulator.**—An insulator in a trolley-wire system, which electrically disconnects one trolley section from another.

**Sectional Feeding Point.**—In a street-railway system, a point where a feeder connects with a section of trolley wire or main-supply conductor.

**Sectional Plating.**—Plating an article with a greater thickness of metal at certain points than at the rest of the surface.

**Sectional Plating-Frame.**—A frame employed for holding an object to be electroplated so that it shall receive a greater

depth of deposit on certain portions of its surface than elsewhere.

**Sectional Trolley-Line.**—A system of trolley wires divided into sections.

**Sectioned Coils for Magnet.**—(1) A term employed for a method of winding a magnetizing coil, in separate compartments. (2) Dividing a winding space into short axial sections, and filling each with wire.

**Secular.**—Of or pertaining to cycles of time.

**Section Switch.**—In a system of railway or power-distribution, a switch controlling and supplying a section.

**Secular Variation.**—A variation in the magnetic declination, which occurs at cycles or great intervals of time, as opposed to diurnal or annual variations.

**Seebeck Effect.**—A term sometimes employed for thermo-electric effect.

**See-Sawing.**—A term employed to characterize the condition of two parallel-connected alternators when they do not synchronize properly.

**See-Sawing of Parallel-Connected Generators.** (1) A term sometimes applied to the hunting of generators. (2) Imperfect synchronism between generators.

**Segment Switch.**—A switch in which a pivoted strip or lever moves over the arc of a circle divided into insulating segments.

**Segmental Core-Disc.**—A dynamo core-disc which, instead of being made in one piece, is formed of suitable joined segments.

**Seismic Photo-Chronograph.**—A chronograph that photographically records seismic disturbances.

**Seismograph, Electric.**—An apparatus for electrically recording the direction and intensity of earthquake shocks.

**Selectance.** The property by virtue of which resonant electric circuits respond more to one frequency of alternating current than to another.

**Selective Absorption.**—The absorption of a particular or selected character of the waves of sound, light, heat or electricity.

**Selective Consonance.**—That property of a consonant alternating-current circuit by virtue of which it responds more to one frequency than to another.

**Selective Emission.**—Selective radiation.

**Selective Opacity.**—(1) Opacity limited to

certain frequencies only. (2) Selectivity as regards transparency.

**Selective Radiation.**—(1) Radiation limited to certain frequencies. (2) Selectivity as regards radiation.

**Selective Resonance.**—The property of a resonant circuit which renders it selective to a definite frequency of alternating current.

**Selective Signal.**—(1) A term sometimes employed for an individual signal. (2) A signal which affects one only of a plurality of translating devices connected to a circuit.

**Selective-Signal Pendulum.**—A system of selective signalling in which the receiving bells respond each to a single alternating-current frequency, and the transmitting frequency is adjusted correspondingly by altering the virtual length of a pendulum swinging in the transmitter.

**Selective Signalling-Apparatus.**—A term sometimes employed for individual signalling-apparatus.

**Selectivity.**—(1) The capability for developing selective action. (2) The degree of capability for effecting selection.

**Selenium.**—A comparatively rare element, generally found associated with sulphur, the electric resistance of which is affected by light.

**Selenium Battery.**—A number of separate selenium cells connected so as to form a single cell or battery.

**Selenium Cell.**—A cell consisting of a mass of selenium fused in between two conducting wires or electrodes of platinized silver, or other suitable metal.

**Selenium Eye.**—A rough model of the human eye in which a selenium resistance takes the place of a retina and two slides the place of the eyelids.

**Selenium Photometer.**—(1) A photometer in which the intensity of the light is estimated by the comparison of the changes in the resistance of a selenium resistance, successively exposed under similar conditions to the light to be measured and to a standard light. (2) A photometer employing the photo-electric properties of selenium.

**Selenium Resistance.**—A mass of selenium employed as a resistance, whose value varies with the variations in the intensity of the light to which it is exposed.

**Self-Acting Make-and-Break.**—A term sometimes employed for an automatic make-and-break.

**Self-Aligning Bearings.**—Journal bear-



ings so constructed and adjusted as to permit of a slight angular range of movement in order to conform to the surface of the shaft.

**Self-Cleaning Contact Key.**—A name sometimes given to a key provided with a rubbing contact.

**Self-Closing Telegraphic Key.**—A telegraphic key provided with an automatic switch in its knob, so that pressing the key opens the switch, and releasing the key automatically closes the switch.

**Self-Compounding Polyphase Generator.**—A polyphase generator whose field magnets are compound-wound, and which supplies the series winding with currents conductively or inductively associated with those in the line.

**Self-Contained Engine or Machine.**—An engine or machine all of whose working parts are within the said engine or machine.

**Self-Cooling Transformer.**—(1) A transformer which maintains its temperature within the necessary safe limits by natural radiation and conduction, without the use of any external cooling apparatus. (2) An oil or air-insulated transformer in which no forced circulation of the air or oil is employed.

**Self-Demagnetizing Force.**—The force exerted by a permanent bar magnet tending to demagnetize itself, owing to the passage of some of its flux back through the bar in the opposite direction to the magnetization through the substance of the steel.

**Self-Excitation.**—An excitation of the field magnets of a generator obtained by leading a portion or all of its own current through its field coils, as distinguished from separate excitation.

**Self-Excited.**—Excited by means of its own current.

**Self-Excited Alternator.**—An alternator whose fields are self-excited.

**Self-Excited Dynamo.**—A dynamo whose field is self-excited.

**Self-Excited Series-Wound Continuous-Current Generator.**—A continuous-current generator having a series-wound field which is excited by the current supplied from the armature of the generator.

**Self-Excited Shunt-Wound Continuous-Current Generator.**—A continuous-current generator having a shunt-wound field which is excited by a small part of the current supplied by the arma-

ture and diverted from the external circuit for that purpose.

**Self-Induced Current.**—A current induced in a circuit, on the opening or closing of the circuit, by changes in its own strength.

**Self-Induction.**—Induction produced in a circuit by the induction of the current on itself at the moment of starting or stopping the current therein.

**Self-Induction Coil.**—(1) A coil of wire possessing self-induction. (2) A choking coil.

**Self-Locking Annunciator Drop.**—A name sometimes given to a self-restoring telephone drop.

**Self-Locking Pole Ratchet.**—A ratchet-winder for raising and lowering an arc-lamp on a pole, and provided with a self-locking attachment.

**Self-Oiling Bearings.**—(1) Bearings provided with automatic oilers. (2) Bearings which lubricate themselves when the shaft is rotating.

**Self-Oiling Journal.**—A journal provided with automatic oilers.

**Self-Polarizing Relay.**—A relay provided not only with the ordinary set of magnetizing coils, but also with an additional magnetizing coil for the magnetization of its tongue, so that the magnetism of the tongue is reversed when the current reverses.

**Self-Recording Magnetometer.**—A magnetometer which is capable of continuously recording the daily and hourly variations of the earth's magnetic field.

**Self-Registering Tachometer.**—A tachometer that provides a permanent record of the varying speed of the machine to which it is connected.

**Self-Registering Wire-Gauge.**—A wire-gauge arranged so as to register the diameter of the wire to be measured.

**Self-Regulating Dynamo.**—A self-regulating generator.

**Self-Regulating Generator.**—A generator so wound as to automatically maintain either a constant current in the circuit, or a constant difference of potential between its terminals, despite changes in the resistance of its load.

**Self-Regulating X-Ray Tube.**—An X-ray tube provided with an automatic means of adjusting the degree of vacuum, and, therefore, the electric pressure at its terminals.

**Self-Regulation.**—Any form of automatic regulation.



**Self-Restoring Annunciator Drop.**—

An annunciator drop so arranged as to be capable of replacing itself, thus dispensing with a manual replacement.

**Self-Restoring Indicator.**—(1) An indicator which will automatically resume its proper position. (2) A self-restoring drop or annunciator.**Self-Starting Alternating-Current Motor.**—

(1) An alternating-current motor which is capable of starting at any normal load. (2) A non-synchronous motor.

**Self-Starting Synchronous Motor.**—

An alternating-current synchronous motor which is in any way enabled to be self-starting when connected with the mains.

**Self-Winding Clock.**—

A clock that is automatically wound at regular intervals by the action of a small electro-magnetic motor, contained within the clock, and operated by one or more voltaic cells concealed in the case of the clock.

**Semaphore.**—A variety of visual signal apparatus employed in railroad block systems.**Semaphore Arm.** A movable arm of a signal apparatus employed in block systems for railroads, for the purpose of indicating the condition of the road as regards other trains.**Semaphore Indicator.**—(1) An annunciator in which a gravity drop or shutter is caused to fall by the action of an electric current, thus exposing a number or other signal back of the drop or shutter. (2) An indicator employed in a semaphoric signalling apparatus. (3) The movable shutter or drop employed in a semaphore.**Semaphoric Electroscope.**—A name sometimes given to a particular form of quadrant electroscope.**Semi-Circular.**—Of or pertaining to a semi-circle or half a circle.**Semi-Circular Deviation of Mariner's Compass.**—A term employed in contradistinction to the quadrantal deviation for the deviation of a magnetic needle, due to the permanent magnetism of the ship, having its resultant in a horizontal plane, and changing sign twice in a complete revolution of the ship.**Semi-Circular Error of Compass Needle.**—The semi-circular deviation of the mariner's compass.**Semi-Conductor.**—A name applied to a group of bodies whose conducting power is, roughly, midway between that of good conductors and insulators.**Semi-Incandescent Electric Lamp.**—

An electric lamp in which the light is due to the combined effects of an electric arc and of incandescence.

**Semi-Period.**—(1) A half period. (2) The time occupied by a reversal or alternation.**Semi-Permanent Telegraph Line.**—

In military telegraphy, a line intermediate in character and method of construction between a permanent line and a temporary line.

**Semi-Permeable Septum.**—

A septum which will permit the passage through it of a solvent, but not of the dissolved substance.

**Sending End of Line.**—The end of a telegraphic line from which the signals are sent.**Sending Leg of Telegraphic Loop.**—

The wire of a telegraphic loop upon which messages are sent, as distinguished from the receiving leg.

**Sending Signaller.**—

The operator on a telegraphic line who is sending the signals as distinguished from one at the other end who is receiving them.

**Sense of Magnetic Force.**—A word sometimes used for direction of magnetic force.**Sensibility of Galvanometer.**—(1) The readiness and degree to which the needle of a galvanometer will respond to the passage of an electric current through its coils. (2) The reciprocal of the current required to produce a definite small angular deflection. (3) The deflection produced by a definite small current strength. (4) The figure of merit of a galvanometer.**Sensitive Flame.**—A flame which alters its shape or size on the sounding of notes possessing the same frequency as that which it is capable of producing.**Sensitive Discharge.**—A thin, thread-like discharge that occurs between the terminals of a high-frequency induction coil.**Sensitive Telephone.**—A telephone that is able to properly respond to currents smaller than those ordinarily employed in telephone apparatus.**Sensitive Tube.**—A coherer.**Sensitiveness of Wheatstone's Balance.**—

The minimum change in the measured resistance which, under the conditions of the test and with the apparatus employed, is capable of either being detected, or of producing the unit of scale deflection in the galvanometer.

**Sent Current.**—The current employed in transmitting a signal.

**Separable Conducting Cord Tip.**—A telephone plug arranged for ready connection with, or disconnection from, a flexible conducting cord.

**Separable Iron Core.**—An iron core which can be removed from the apparatus in which it is used.

**Separate-Circuit Dynamo.**—(1) A term sometimes employed for a self-exciting dynamo in which a special or separate armature circuit is connected to the fields. (2) A dynamo capable of supplying a plurality of separate circuits.

**Separate-Circuit Motor.**—A term sometimes applied to a motor whose armature is provided with two windings having two separate commutators, the main one being supplied with the driving current.

**Separate-Coil Alternator.**—An alternator whose field magnets are excited by means of current taken from the coils of the armature after it has been commuted.

**Separate-Coil Dynamo-Electric Machine.**—A term sometimes used for a separate-coil alternator.

**Separate-Coil Machine.**—(1) A machine in which the armature coils are mechanically separated from each other, as distinguished from a machine in which the coils are interlaced. (2) A dynamo-electric machine in the armature of which there exists a separate coil or winding for the special purpose of exciting the field magnets.

**Separate Excitation.**—The excitation of the field magnets produced by a source external to the machine.

**Separate Touch.**—A phrase sometimes employed for magnetization by separate touch.

**Separately-Excited Alternator.**—An alternator whose field magnets are separately excited.

**Separately-Excited Dynamo-Electric Machine.**—A dynamo-electric machine whose field coils are separately excited.

**Separately-Excited Field.**—The field of a dynamo that receives its magnetizing current from a source outside or separate from the dynamo.

**Separator.**—A corrugated and perforated insulating sheet of ebonite or other similar substance, shaped so as to conform to the outlines of the plates of a storage battery, and placed between them at suitable intervals in such a manner as to prevent their short-circuiting, but without impeding the free circulation of the liquid.

**Septum.**—The porous partition of an endosmometer.

**Series and Magneto Dynamo-Electric Machine.**—A compound wound dynamo in which the armature circuit of a magneto-electric machine is connected and excites the line winding on the magnets.

**Series-and-Separately-Excited Dynamo-Electric Machine.**—A compound wound dynamo whose field magnets are wound with two separate circuits connected in series with the field magnets and the external circuit, and the other with some source by means of which separately excited.

**Series-and-Shunt-Wound Dynamo-Electric Machine.**—A compound wound dynamo whose field magnets are wound with two separate coils, one in series with the armature and the other in shunt with the armature.

**Series-Arc Cut-Out.**—A device for automatically preventing a short-circuit in a faulty lamp in a series-connected circuit so that the failure of a lamp does not interfere with the operation of the rest of the lamps.

**Series Board.**—A series-connected multiple telephone switchboard.

**Series Circuit.**—A circuit in which separate sources or separate electroreceptive devices, or both, are so placed that the current produced in it or passing through it passes successively through the entire circuit from the first to the last.

**Series-Connected Battery.**—A battery of series-connected cells.

**Series-Connected Incandescent Lamps.**—A number of lamps connected to a circuit in series and provided with a fuse or other similar cut out, to prevent the failure of a single lamp from extinguishing all the rest.

**Series-Connected Electro-Receptive Devices.**—A number of electroreceptive devices connected to a circuit in series.

**Series-Connected Sources.**—A number of separate sources so connected in series as to act as a single source.

**Series-Connected Translating Device.**—A term sometimes used for series-connected electro-receptive devices.

**Series-Connected Voltaic Cells.**—A number of voltaic cells so connected in series as to be capable of acting as a source or battery.

**Series Connection.**—Such a connection of a number of separate electric sources or electro-receptive devices or cells.

current passes successively from the first to the last in the circuit.

**Connection for Condensers.**—The connection of a number of condensers in series.

**Connection of Alternators.**—The connection of two or more alternators in series.

**Converter.**—A series transformer.

**Distribution.**—A distribution of energy in which the receptives are placed one after another in series upon a single conductor, extending throughout the entire circuit from pole to pole.

**Dynamo.**—A series-wound dynamo.

**Field-Terminals of Motor.**—The terminals of a compound-wound motor are connected to the ends of a series winding.

**Grouping of Armature Connections.**—(1) A two-circuit multipolar winding. (2) A winding for a multipolar armature in which only two paths are provided for the current between the brushes.

**Incandescent Lamp.**—An incandescent lamp suitable for use in a series circuit.

**Incandescent Lighting System.**—A system of incandescent lighting in which the lamps are connected in series, distinguished from a multiple system in which they are connected in parallel.

**Motor.**—(1) A motor suitable for use in a series circuit. (2) A series-wound motor.

**Multiple.**—A series-multiple connection.

**Multiple Car-Controller.**—A controller provided for starting and stopping a motor car, for varying its speed, the torque of its motors, by connecting the motors either in series or in parallel with or without resistances.

**Multiple Circuit.**—A compound circuit in which a number of separate circuits or separate electro-receptive devices or both, are connected in a series of separate groups in multiple connection, these separate groups being connected in series.

**Multiple-Connected Electro-Receptive Devices.**—A connected system in which a number of separate electro-receptive devices are joined in parallel into separate groups, and all of these groups are connected in series.

**Multiple-Connected Sources.**—The connection of a number of separate

electric sources so as to form a single source, in which the separate sources are connected in a number of separate multiple groups or circuits, and these groups or circuits separately connected together in series.

**Series-Multiple-Connected Translating Devices.**—Series-multiple-connected electro-receptive devices.

**Series-Multiple Connection.**—Such a connection of a number of separate electro-receptive devices that the devices are placed in multiple groups or circuits and these separate groups afterwards connected with one another in series.

**Series-Multiple Switchboard.**—A telephone switchboard, in which a subscriber's jacks are connected in series, while plug connections are made in parallel or across the circuit.

**Series-Parallel Controller.**—A series-multiple car controller.

**Series Transformer.**—A term sometimes applied to a converter whose primary coil is connected in series with the primary coils of other similar transformers in the primary circuit.

**Series Turns of Dynamo-Electric Machine.**—The magnetizing field-magnet coils of a dynamo that are connected in series with the armature circuit.

**Series Winding.**—A winding of a dynamo electric machine in which a single set of magnetizing coils are placed on the field-magnet cores and connected in series with the armature and the external circuit.

**Series-Wound Dynamo-Electric Machine.**—A dynamo-electric machine in which the field circuit and the external circuit are connected in series with the armature circuit, so that the armature current passes through the field winding into the external circuit.

**Series-Working of Dynamo-Electric Machines.**—Such a coupling of several dynamo-electric machines as will deliver in series the current supplied by them.

**Series-Wound Field.**—The field of a dynamo in which the armature current passes through the magnetizing coil.

**Series-Wound Laminated Synchronous Motor.**—A series-wound synchronous motor provided with a laminated core.

**Series-Wound Motor.**—A motor provided with a series-wound field.

**Serrated Lightning Arrester.**—A term sometimes applied to a saw-tooth lightning arrester.

**Separable Conducting Cord Tip.**—A telephone plug arranged for ready connection with, or disconnection from, a flexible conducting cord.

**Separable Iron Core.**—An iron core which can be removed from the apparatus in which it is used.

**Separate-Circuit Dynamo.**—(1) A term sometimes employed for a self-exciting dynamo in which a special or separate armature circuit is connected to the fields. (2) A dynamo capable of supplying a plurality of separate circuits.

**Separate-Circuit Motor.**—A term sometimes applied to a motor whose armature is provided with two windings having two separate commutators, the main one being supplied with the driving current.

**Separate-Coil Alternator.**—An alternator whose field magnets are excited by means of current taken from the coils of the armature after it has been commuted.

**Separate-Coil Dynamo-Electric Machine.**—A term sometimes used for a separate-coil alternator.

**Separate-Coil Machine.**—(1) A machine in which the armature coils are mechanically separated from each other, as distinguished from a machine in which the coils are interlaced. (2) A dynamo-electric machine in the armature of which there exists a separate coil or winding for the special purpose of exciting the field magnets.

**Separate Excitation.**—The excitation of the field magnets produced by a source external to the machine.

**Separate Touch.**—A phrase sometimes employed for magnetization by separate touch.

**Separately-Excited Alternator.**—An alternator whose field magnets are separately excited.

**Separately-Excited Dynamo-Electric Machine.**—A dynamo-electric machine whose field coils are separately excited.

**Separately-Excited Field.**—The field of a dynamo that receives its magnetizing current from a source outside or separate from the dynamo.

**Separator.**—A corrugated and perforated insulating sheet of ebonite or other similar substance, shaped so as to conform to the outlines of the plates of a storage battery, and placed between them at suitable intervals in such a manner as to prevent their short-circuiting, but without impeding the free circulation of the liquid.

**Septum.**—The porous partition of an endosmometer.

**Series and Magneto Dynamo-Electric Machine.**—A compound-wound dynamo in which the armature circuit of a magneto-electric machine is connected with and excites the fine winding on the field magnets.

**Series-and-Separately-Excited Dynamo-Electric Machine.**—A compound-wound dynamo whose field magnet cores are wound with two separate circuits, one connected in series with the field magnets and the external circuit, and the other with some source by means of which it is separately excited.

**Series-and-Shunt-Wound Dynamo-Electric Machine.**—A compound-wound dynamo whose field magnets are wound with two separate coils, one in series with the armature and the external circuit, and the other in shunt with the armature.

**Series-Are Cut-Out.**—A device for automatically providing a short-circuit past a faulty lamp in a series-connected circuit, so that the failure of a lamp to operate may not interfere with the operation of the rest of the lamps.

**Series Board.**—A series-connected multiple telephone switchboard.

**Series Circuit.**—A circuit in which the separate sources or separate electro-receptive devices, or both, are so placed that the current produced in it or passed through it passes successively through the entire circuit from the first to the last.

**Series-Connected Battery.**—A battery of series-connected cells.

**Series-Connected Incandescent Lamps.**—A number of lamps connected to a circuit in series and provided with a fuse or other similar cut-out, to prevent the failure of a single lamp from extinguishing all the rest.

**Series-Connected Electro-Receptive Devices.**—A number of electro-receptive devices connected to a circuit in series.

**Series-Connected Sources.**—A number of separate sources so connected in series as to act as a single source.

**Series-Connected Translating Devices.**—A term sometimes used for series-connected electro-receptive devices.

**Series-Connected Voltaic Cells.**—A number of voltaic cells so connected in series as to be capable of acting as a single source or battery.

**Series Connection.**—Such a connection of a number of separate electric sources or electro-receptive devices or circuits



that the current passes successively from the first to the last in the circuit.

**Series-Connection for Condensers.**—The connection of a number of condensers in series.

**Series-Connection of Alternators.**—The connection of two or more alternators in series.

**Series Converter.**—A series transformer.

**Series Distribution.**—A distribution of electric energy in which the receptive devices are placed one after another in succession upon a single conductor, extending throughout the entire circuit from pole to pole.

**Series Dynamo.**—A series-wound dynamo.

**Series Field-Terminals of Motor.**—The terminals of a compound-wound motor which are connected to the ends of a series field-winding.

**Series Grouping of Armature Conductors.**—(1) A two-circuit multipolar winding. (2) A winding for a multipolar armature in which only two paths are provided for the current between the brushes.

**Series Incandescent Lamp.**—An incandescent lamp suitable for use in a series circuit.

**Series Incandescent Lighting System.**—A system of incandescent lighting in which the lamps are connected in series, as distinguished from a multiple system in which they are connected in parallel.

**Series Motor.**—(1) A motor suitable for use in a series circuit. (2) A series-wound motor.

**Series-Multiple.**—A series-multiple connection.

**Series-Multiple Car-Controller.**—A controller provided for starting and stopping a double motor car, for varying its speed, or the torque of its motors, by connecting the motors either in series or in parallel with or without resistances.

**Series-Multiple Circuit.**—A compound circuit in which a number of separate sources, or separate electro-receptive devices, or both, are connected in a number of separate groups in multiple arc, and these separate groups subsequently connected in series.

**Series-Multiple-Connected Electro-Receptive Devices.**—A connected system in which a number of separate electro-receptive devices are joined in parallel in separate groups, and all of these groups subsequently connected in series.

**Series-Multiple-Connected Sources.**—The connection of a number of separate

electric sources so as to form a single source, in which the separate sources are connected in a number of separate multiple groups or circuits, and these groups or circuits separately connected together in series.

**Series-Multiple-Connected Translating Devices.**—Series-multiple-connected electro-receptive devices.

**Series-Multiple Connection.**—Such a connection of a number of separate electro-receptive devices that the devices are placed in multiple groups or circuits and these separate groups afterwards connected with one another in series.

**Series-Multiple Switchboard.**—A telephone switchboard, in which a subscriber's jacks are connected in series, while plug connections are made in parallel or across the circuit.

**Series-Parallel Controller.**—A series-multiple car-controller.

**Series Transformer.**—A term sometimes applied to a converter whose primary coil is connected in series with the primary coils of other similar transformers in the primary circuit.

**Series Turns of Dynamo-Electric Machine.**—The magnetizing field-magnet coils of a dynamo that are connected in series with the armature circuit.

**Series Winding.**—A winding of a dynamo-electric machine in which a single set of magnetizing coils are placed on the field-magnet cores and connected in series with the armature and the external circuit.

**Series-Wound Dynamo-Electric Machine.**—A dynamo-electric machine in which the field circuit and the external circuit are connected in series with the armature circuit, so that the armature current passes through the field winding into the external circuit.

**Series-Working of Dynamo-Electric Machines.**—Such a coupling of several dynamo-electric machines as will deliver in series the current supplied by them.

**Series-Wound Field.**—The field of a dynamo in which the armature current passes through the magnetizing coil.

**Series-Wound Laminated Synchronous Motor.**—A series-wound synchronous motor provided with a laminated core.

**Series-Wound Motor.**—A motor provided with a series-wound field.

**Serrated Lightning Arrester.**—A term sometimes applied to a saw-tooth lightning arrester.

**Service.**—A conductor or set of conductors supplying electric energy from electric mains to the premises of a consumer.

**Service Block.**—(1) A block connected with service wires. (2) A block for supporting and connecting service wires.

**Service Conductors.**—Service wires.

**Service Line.**—(1) A service wire. (2) In telephony, a line or circuit connecting a switchboard with a subscriber.

**Service Tube.**—A tube provided for the introduction of service wires.

**Service Wires.**—(1) The wires which lead into a building and which are connected to the supply mains or supply circuit. (2) The wires through which service is given to a consumer. (3) Delivery wires.

**Serving Mallet.**—A tool employed for placing the tarred yarn serving on a cable splice.

**Serving of Cable.**—The bedding of tape, yarn, jute or compound in a cable as distinguished from the core or the sheathing.

**Serving Tool.**—A tool employed in placing the serving on a cable.

**Seven-Point Jacks.**—In a multiple telephone switchboard, jacks having each seven different points of contact.

**Sextant.**—An optical device consisting of a fixed and movable mirror, employed for measuring the angular distance between any two objects.

**Sextaplex Telegraph.**—A general term embracing the apparatus used in sextaplex telegraphy.

**Sextaplex Telegraphy.**—A system of telegraphy whereby six distinct messages can be simultaneously transmitted over the same line, three in one direction and three in the opposite direction.

**Sextaplex Transmission.**—Transmitting intelligence by means of sextaplex telegraphy.

**Sextipolar.**—Possessing six poles.

**Sextipolar Dynamo.**—A dynamo possessing a sextipolar field.

**Sextipolar Field.**—A field produced by six magnet poles.

**Sextuple Telegraph.**—A general term for the apparatus employed in sextuple telegraphy.

**Sextuple Telegraphy.**—A system of telegraphic communication in which six separate messages are simultaneously sent over a line in the same direction.

**Sextuple Transmission.**—The transmission of intelligence by sextuple telegraphy.

**Sextuply Re-Entrant.**—An armature provided with six separate conducting paths or windings, each of which is independently re-entrant.

**Shackle Insulator.**—A term applied to any form of insulator used for shackling a wire, as distinguished from an insulator which merely supports a wire.

**Shackling a Wire.**—(1) Inserting an insulator between the two ends of a cut wire. (2) Securing the end of a telegraph or telephone wire to a shackle.

**Shaded.**—(1) Cut off or screened from the effects of an electro-static or magnetic field. (2) Screened.

**Shaded-Pole Motor.**—An alternating-current motor in which the rotary effect is obtained by placing short circuited coils on a portion of the polar faces.

**Shade-Holder.**—A ring or circle clamped to the socket of an incandescent lamp for supporting a shade.

**Shading Coil of Alternating-Current Motor.**—A conducting coil or loop covering part of one or more poles in an alternating-current motor, for the purpose of retarding the magnetic flux through that portion of the pole, and thereby exerting a tangential drag on the armature.

**Shadow, Electric.**—A term sometimes used for molecular shadow.

**Shadowgram.**—A term sometimes used for radiograph. (Not in general use.)

**Shadowgraph.**—A word frequently used for radiograph.

**Shadow Photometer.**—A photometer in which the intensity of the light to be measured is estimated by a comparison of the distance at which it and the standard light produce shadows of the same intensity.

**Shallow-Water Submarine Cable.**—A submarine cable intended for use in shallow water, where the cable is apt to be injured by friction against a rocky bottom, and therefore provided with heavier armor than a deep-sea cable.

**Shear.**—A strain consisting of an extension in one direction combined with an equal compression perpendicular thereto.

**Shearing Stress.**—A stress producing a shear.

**Sheathing of Cable.**—The armor or protecting covering employed for surrounding the core of a cable.

**Sheathing Wires.**—The metallic wires which form the armor of a submarine cable.

**Shed of Insulator.**—A petticoat or inverted cone of a telegraph insulator.

**Sheer.**—The curve which the line of ports or the deck of a ship presents to the eye, when observed from one side.

**Sheet Lightning.**—A variety of lightning flash, unaccompanied by thunder audible to an observer, in which the surfaces of clouds are illumined.

**Shell of Arc-Lamp.**—The outside casing of an arc-lamp.

**Shell of Commutator.**—A term sometimes employed for the commutator form, separated from its shaft.

**Shell of Fixture.**—A light ornamental metallic casing covering some part of an electrolier.

**Shell Transformer.**—(1) A transformer whose primary and secondary coils are laid on each other, and the iron core is then wound through and over them, so as to completely enclose them. (2) A form of iron-clad transformer.

**Shellac.**—A resinous substance obtained from the roots and branches of certain tropical plants, which possesses high insulating powers, and high specific inductive capacity.

**Shifting Magnetic Field.**—(1) A magnetic field whose lines of magnetic force are changing position with respect to the axis of the magnet pole from which they emanate. (2) A rotary magnetic field.

**Shifting of Phase of Alternating Current.**—In an alternating-current circuit the changes in the phase relation of current strength to impressed E. M. F. depending upon variations in the frequency or in the impedance.

**Shifting of Spot of Light.**—Any movement of a spot of light on a scale causing that spot to move away from its true zero position, produced by causes other than those acting during the proper operation of the instrument.

**Shifting Zero.**—(1) A zero that changes or shifts its position. (2) A false zero in measuring instruments.

**Ship Dynamometer.**—A dynamometer employed on board a cable ship for the purpose of indicating the strain on a grappling rope or on a cable.

**Ship Return-Circuit System.**—A name applied to a single-wire system or form of circuit in which the hull of the ship forms the return wire.

**Shock.**—(1) Objectively, a concussion or blow. (2) Subjectively, a violent nervous stimulus.

**Shock, Electric.**—A physiological shock produced in an animal by an electric discharge.

**Shoe of Contact for Street Railway.**—The metallic contact piece which rubs against a surface rail or conduit rail in a street railway system.

**Shoe Plug.**—A form of sliding contact-plug for insertion in a jack of a telephone switchboard.

**Shore-End of Telegraphic Cable.**—(1) A shallow-water section of submarine cable. (2) The end of a submarine cable landed on a shore.

**Short Arc System of Electric Lighting.**—A system of electric lighting in which short voltaic arcs are maintained between carbon electrodes.

**Short Circuit.**—(1) A shunt or by-path of negligible or comparatively small resistance, placed around any part of an electric circuit through which so much of the current passes as to virtually cut out the parts of the circuit to which it acts as a shunt. (2) An accidental direct connection between the mains or main terminals of a dynamo or system producing a heavy overload of current. (3) To cut out of circuit by a short conductor. (4) To accidentally produce a short circuit.

**Short-Circuit-Key.**—A key which in its normal position short-circuits a galvanometer, or other device with which it is connected.

**Short-Circuited.**—(1) Placed on a short-circuit. (2) Cut out by means of a short-circuit.

**Short-Circuited Conductor.**—A conductor which has a short-circuit established past it.

**Short Circuiting.**—(1) Cutting out of circuit by means of a short-circuit. (2) Establishing a direct connection between the terminals of a source or device, or between mains connected to them.

**Short-Circuiting a Dynamo-Electric Machine.**—(1) Cutting out the external circuit of a dynamo by means of a short-circuit. (2) Connecting the poles or terminals of a dynamo by a circuit of negligibly small resistance. (3) Greatly overloading a constant potential machine, and underloading a constant-current machine.

**Short-Circuiting Plug.**—(1) A plug which when inserted in its receptacle short-circuits the device connected therewith. (2) A plug employed in short-circuiting a coil or other resistance.

**Short-Closed Circuit.**—In a series dis-



tribution circuit, the condition of having short-circuited devices, as distinguished from a long-closed circuit from which all short circuits have been removed.

**Short-Coil Magnet.**—A magnet whose magnetizing coil consists of a few turns of short thick wire.

**Short Connection of Two-Circuit Gramme-Winding.**—A form of Gramme winding in which the circuits from brush to brush consist of conductors influenced by all the poles, so that the E. M. F.'s generated in the two circuits are necessarily equal.

**Short-Connection Two-Circuit Armature Winding.**—(1) Such a two-circuit winding that in each circuit between the brushes electromotive forces are induced by each and all the poles of the field frame. (2) Such a type of two-circuit winding as connects coils together lying in adjacent fields.

**Short-Core Electro-Magnet.**—An electro-magnet provided with a short core.

**Short-End of Quadruplex Battery.**—The end of a quadruplex battery, the smaller portion of which is always in circuit, as opposed to the end of the extra battery thrown in circuit by the depression of the increment key.

**Short-Shunt Compound-Winding.**—A compound winding of a dynamo-electric machine in which the shunt coil is connected directly, or through resistance, with the armature brushes, as distinguished from a long-shunt compound-winding.

**Short-Shunt Compound-Wound Dynamo-Electric Machine.**—A compound-wound dynamo whose field-magnet coils form a shunt to the armature only, as distinguished from a shunt to the armature and series coils combined.

**Short-Sightedness.**—(1) The condition of the eye in which distinct images are formed of those objects only which are near to the eye. (2) Myopia. (3) The condition of sight pertaining to an elongated eyeball.

**Short Timber.**—A term applied to timber that has been improperly subjected to preservative processes, and has thereby been rendered brittle.

**Short Wire Repeater.**—A repeater between a duplex or quadruplex and a branch office wire.

**Shower-Bath, Electric.**—A device for carrying an electric charge to the body of a patient by the falling water.

**Shunt.**—An additional, or by-path estab-

lished for the passage of an electric current or discharge.

**Shunt.**—To establish an additional, or by-path for the passage of an electric current or discharge.

**Shunt-and-Separately-Excited Dynamo-Electric Machine.**—A compound-wound dynamo in which the field is excited both by means of a shunt to the armature circuit, and by a current produced by a separate source.

**Shunt Bell, Electric.**—An electric bell whose magnetizing coils are connected to the line wire in shunt.

**Shunt Breaking Resistance.**—A resistance for insertion in the field of a shunt dynamo, before breaking its circuit, to prevent the production of a dangerously powerful induced pressure.

**Shunt-Circuit.**—(1) A derived circuit. (2) A branch or additional circuit, provided in any part of a circuit, through which the current branches or divides, part flowing in the original circuit and part through the new branch or shunt. (3) A circuit for diverting or shunting a portion of the current.

**Shunt Coil.**—A coil placed in a shunt circuit.

**Shunt Dynamo.**—A shunt-wound dynamo-electric machine.

**Shunt-Field Terminals of Motor.**—The terminals of the shunt field coils of an electric motor.

**Shunt for Ammeter.**—(1) A shunt coil connection in multiple with the coils of an ammeter for the purpose of changing the value of the readings. (2) A reducer.

**Shunt Spool.**—A spool or coil of insulated wire placed in a shunt circuit.

**Shunt Street-Car Motor.**—A shunt-wound car motor.

**Shunt Ratio.**—(1) The ratio existing between a shunt and the circuit it shunts. (2) The ratio existing between the total current strength and the current strength in the branch to which the shunt is applied.

**Shunt Rheostat.**—A rheostat placed in a shunt-circuit.

**Shunt Turns of Dynamo.**—The ampere turns in the shunt circuit of a shunt-wound or compound-wound dynamo.

**Shunt Winding.**—A term sometimes employed for the shunt field coils on a shunt-wound dynamo or motor.

**Shunt-Wound Dynamo-Electric Machine.**—A dynamo-electric machine whose field-magnet coils are placed in



shunt with the armature circuit, so that only a portion of the current generated passes through the field-magnet coils, but all the difference of potential of the armature acts at the terminals of the field circuit.

**Shunt-Wound Field.**—The field of a dynamo in which the field-magnet coils are placed in shunt with the armature and external circuit.

**Shunt-Wound Motor.**—A motor whose field-magnet coils are placed in shunt to the armature circuit.

**Shunted.**—Provided with a shunt.

**Shunting.**—Providing with a shunt.

**Shunting Air-Gap.**—(1) An air-gap in a circuit placed around a galvanometer or other instrument, for the purpose of protecting it from the effects of a powerful disruptive discharge. (2) An air-gap shunt in a magnetic circuit.

**Shutter Apparatus.**—In a system of visual telegraphy, an apparatus for suddenly displaying and obscuring a light by means of hand-controlled shutters.

**Shutter Indicator Armature.**—The armature of an electro-magnet so arranged that when released it displays an indicator on an annunciator.

**Shuttle Armature.**—(1) A variety of drum armature in which a single coil of wire is wound in an H-shaped groove formed in a bobbin-shaped core. (2) The old form of Siemens' armature.

**Shuttle-Wound Armature.**—An armature whose coils are placed on its core by first winding the wire on a shuttle and passing the same through the opening or gap provided for the coil.

**Side A of Quadruplex Table.**—That side of a quadruplex system which is worked by means of reversed currents.

**Side B of Quadruplex Table.**—That side of a quadruplex system which is worked by means of strengthened currents.

**Side-Bar Suspension of Motor.**—In a street railway car truck, a method of supporting the motors which consists in employing a pair of bars or light girders mounted on springs parallel to the side frames and supporting the motors from these bars.

**Side Bracket.**—A particular form of single insulator bracket.

**Side Commutator.**—The commutator of a dynamo-electric machine placed on the side of the revolving armature.

**Side Current.**—A term applied by Hertz to the current produced in the side circuit of a micrometer.

**Side Flash.**—A sparking or lateral discharge taking place from the sides of a conductor through which an impulsive rush of electricity is passing.

**Side-Lights, Electric.**—Red or green lanterns placed on permanent fixtures on either side of a ship.

**Side of Three-Wire System.**—(1) A term applied to the positive or negative conductors or leads in the three-wire system of distribution. (2) The positive or the negative half of a three-wire system.

**Side Pole.**—A trolley-wire pole mounted at the side of a track as distinguished from a central pole.

**Side Pole Line.**—An aerial line supported from poles placed on the side of a street or road, as distinguished from a centre pole line or from one supported from poles placed in the centre of the street or road.

**Side-Pole Trolley-Line Construction.**—A method for the suspension of aerial trolley lines in which the trolley and feed wires are suspended from poles placed on one side of the street or road.

**Side Suspension of Motor.**—A side-bar suspension of a motor in a truck.

**Side Telegraphic Repeater.**—A telegraphic repeater which operates adjacent circuits from a main line.

**Sides of Throo-Wire System.**—(1) The portions of a three-wire system which have respectively positive and negative potentials. (2) The positive and negative portions of a three-wire system.

**Sidereal.**—Of or pertaining to the stars.

**Sidero-Magnetic.**—A term proposed for ferro-magnetic.

**Siemens Armature Electro-Magnetic Bell.**—A form of electro-magnetic bell, the movements of whose armature are obtained by the reversal of polarity that occurs when alternating currents are passed through a single-coil Siemens armature.

**Siemens Differential Voltmeter.**—A form of voltmeter employed by Siemens for determining the resistance of the platinum spiral used in his electro-pyrometer.

**Siemens Electro-Dynamometer.**—A form of galvanometer employed for the measurement of electric currents.

**Siemens Electro-Pyrometer.**—An apparatus for the determination of temperature by the measurement of the electric resistance of a platinum wire exposed to the source of heat, the temperature of which is to be measured.

**Siemens-Halske Voltaic Cell.**—A zinc-copper couple whose elements are employed with dilute sulphuric acid and a saturated solution of copper sulphate respectively.

**Siemens Water Pyrometer.**—A pyrometer employed for determining the temperature of a furnace or other intense source of heat, by the increase in the temperature of a known weight of water to which a metal cylinder of a given weight has been put, after exposure for a given time to the source of heat to be measured.

**Signal Arm.**—A semaphore arm.

**Signal-Service System for Electric Railroad.**—A system of electric signals used on railroads for ascertaining the condition of the road, sending instructions to engineers, and conveying intelligence generally from stations along the road to running trains.

**Sight-Feeding Oil.**—A glass oil-cup which permits the visible feeding of lubricating oil to the journal bearings.

**Signature.**—In telegraphy, a name of the sender of a message as it appears upon the same.

**Silence Telephone Cabinet.**—A long-distance telephone cabinet.

**Silent.**—A switch device for preventing the action of an electric alarm by short-circuiting it.

**Silent Discharge.**—A name sometimes given to a convective discharge, in order to distinguish it from the more noisy disruptive discharge.

**Silhougraph.**—A word proposed for radiograph.

**Silver Bath.**—An electrolytic bath containing a readily electrolyzable salt of silver, and a plate of silver acting as the anode, placed in the liquid near the object to be coated which forms the cathode.

**Silver Chloride Voltaic Cell.**—A zinc-silver couple immersed in electrolytes of sal-ammoniac or common salt, and silver chloride, respectively.

**Silver-Palladium Alloy.**—An alloy of silver with palladium and other metals, employed for the hair-springs, escapements and balance-wheels of watches, on account of its non-magnetic properties.

**Silver Plating.**—Covering the surfaces of the base metals with an adherent coating of silver by the electric current.

**Silver Voltameter.**—A voltmeter in which the quantity of electricity passing is determined by the weight of silver deposited.

**Silvered Plumbago.**—Powdered plumbago covered with metallic silver, for use in the metallization of objects to be electro-plated.

**Silurus Electricus.**—The electric eel.

**Similar.**—Conductors in the secondary winding of an induction machine which are similar to each other in respect to the magnitude of their induced electromotive forces at any instant, and symmetrically disposed relatively to the rotating poles.

**Simple Alternating-Currents.**—(1) Sinusoidal alternating currents. (2) Simple-harmonic currents.

**Simple Arc.**—A voltaic arc formed between two electrodes.

**Simple Circuit.**—A term sometimes employed for a circuit containing a single electric source and a single electro-receptive device.

**Simple Electric Candle Burner.**—A plain-pendant electric burner.

**Simple-Harmonic Currents.**—(1) Currents whose flow is variable both in strength and duration, and in which the quantity of electricity passing by any section of conductor may be represented by a simple-harmonic curve. (2) A current of such a nature that the continuous variation of the flow of electricity past any area of cross-section of the conductor, or the continuous variations in electromotive force, may be expressed by a simple-harmonic curve.

**Simple-Harmonic Curve.**—The curve which results when a simple-harmonic motion in one line is compounded with uniform motion in a straight line at right angles thereto.

**Simple-Harmonic Electromotive Forces.**—Electromotive forces which vary in such a manner as to produce simple-harmonic currents; or, electromotive forces whose variations can be correctly represented by a simple-harmonic curve.

**Simple-Harmonic Motion.**—(1) Motion which repeats itself at regular intervals in one line, taking place backwards or forwards, and which is the orthogonal projection of the path of a point moving uniformly in a plane circle upon a diameter of the circle. (2) Motion which is a simple-periodic function of the time. (3) Simple-periodic motion.

**Simple-Harmonic Variation.**—A variation of current or electromotive force which takes place in accordance with simple-harmonic law.

**Simple Immersion.**—A term sometimes employed for an electrolytic deposit obtained by merely dipping a metal in a solution of a metallic salt.

**Simple Magnet.**—A simple magnetized bar.

**Simple Magnetic Shell.**—A magnetic shell whose strength is everywhere the same.

**Simple-Periodic Currents.**—A term sometimes used for simple-harmonic currents.

**Simple-Periodic Curve.**—A simple-harmonic curve.

**Simple-Periodic Electromotive Force.**—A simple-harmonic electromotive force.

**Simple-Periodic Motion.**—Simple-harmonic motion.

**Simple-Periodic Variation.**—Simple-harmonic variation.

**Simple Radical.**—(1) An unsaturated atom with its bond or bonds free. (2) A single unsaturated atom, as distinguished from an unsaturated group of atoms.

**Simple Rigidity.**—(1) In an isotropic body the ratio of shearing stress to the resulting shear. (2) Resistance to shearing. (3) In an isotropic body the edges of a unit cube to which tangential shearing stresses are applied, the ratio of the tangential force to the angular distortion effected in the cube.

**Simple Shunt.**—A coil arranged as a shunt, and unprovided with an iron core.

**Simple-Sine Motion.**—A term sometimes employed for simple-harmonic motion.

**Simple Voltaic Cell.**—A term sometimes used for a single-fluid cell.

**Simplex Telegraph.**—A general term embracing the apparatus employed in simplex telegraphy.

**Simplex Telegraphy.**—A system of telegraphy in which a single message only can be sent over the line wire.

**Simplex Working.**—(1) Transmitting messages by simplex telegraphy. (2) A word sometimes employed for simple telegraphic transmission.

**Sims-Edison Torpedo.**—A special form of torpedo in which electricity is both the propelling and directing power, but the electric source is situated outside the torpedo, and is connected with the same by a light cable.

**Sine Galvanometer.**—A galvanometer whose deflecting coil is placed in a vertical plane movable about a vertical axis, so that it can be made to follow the magnetic needle in its deflections.

**Sine Law.**—(1) A law of magnitude de-

fined by the sines of angles. (2) A magnitude which follows the sines of successive angles.

**Single Brush-Rocker Arm.**—A device by means of which a single pair of brushes are so situated on a dynamo or motor as to be capable of being readily shifted into the desired position on the commutator cylinder.

**Single-Brush Yoke.**—A term sometimes used for single brush-rocker arm.

**Single-Circuit.**—An undivided circuit.

**Single-Contact Carbon Telephone.**—A form of microphonic telephone transmitter, in which a single contact is employed.

**Single-Contact Key.**—Any key which makes a single contact only.

**Single-Cord Multiple-Telephone Switchboard.**—(1) A multiple telephone switchboard employing a single conducting cord in establishing connections. (2) A multiple-telephone switchboard in which the circuits are all ground-return-circuits, and the subscribers' jacks are all connected in series.

**Single-Cord Switchboard.**—(1) A telephone switchboard in which an inter-connection between two subscribers is effected through a single cord. (2) A telephone switchboard in which each line terminates in a plug.

**Single-Cord Telephone Switchboard.**—A telephone switchboard employing single conducting cords.

**Single-Cup Insulator.**—An insulator consisting of a single inverted cup.

**Single Curb.**—A device for increasing the speed of telegraphic signalling by ridding the line of its previous charge by means of a single reversed current sent through it after each signal, before connecting to the ground, as distinguished from a double curb in which a succession of two reversed currents follow each signal.

**Single-Curb Signalling.**—Signalling by means of a single curb.

**Single-Current Signalling.**—Signalling by means of makes or breaks in the circuit of a single current.

**Single-Current Closed-Circuit Signalling.**—A method of telegraphic signalling in which the line circuit is normally closed, being only broken by the sending operator, while the current in the circuit has only one direction.

**Single-Current Key.**—A key employed in single-current signalling.

**Single-Current Open-Circuit Signal.**



ling.—A method of telegraphic signalling in which the main-line batteries are fixed at each station, and are in circuit only when signalling.

**Single-Current Telegraphic Working.**—A term sometimes used for single-current signalling.

**Single-Current Translator.**—A telegraphic translator suitable for use in single-current working.

**Single-Curve Suspension.**—(1) A suspension suitable for the support of a trolley wire at a single curve in the line, or single-track curve. (2) A form of suspension having a single curved holder or support.

**Single-Curve Trolley Hanger.**—(1) A hanger supporting a single-curve wire or single-track curve wire. (2) A trolley hanger supported by a single curved holder.

**Single-Curve Trolley-Suspension.**—(1) Suspension of a trolley wire by a single-curve trolley-hanger. (2) A single-track trolley-suspension at a curve in the track.

**Single-Coil Field Dynamo.**—A dynamo whose magnetic field is obtained from a single magnetizing coil.

**Single Field-Coil Multipolar Dynamo.**—A multipolar dynamo having a single field coil on a single core provided with a plurality of polar projections.

**Single-Fluid.**—Pertaining to the single-fluid hypothesis of electricity or magnetism.

**Single-Fluid Hypothesis of Electricity.**—A hypothesis which endeavors to explain the cause of electrical phenomena by the assumption of the existence of a single electric fluid.

**Single-Fluid Voltaic Cell.**—A voltaic cell in which but a single fluid or electrolyte is used.

**Single-Focus X-Ray Tube.**—An X-ray tube suitable for use in connection with pulsatory currents, and provided with a single deflecting plate or anticathode opposite the cathode.

**Single-Line Repeater.**—In telegraphy, a repeater from a single circuit into another.

**Single-Liquid Voltaic Cell.**—A single-fluid voltaic cell.

**Single-Loop Armature.**—An armature consisting of a closed conducting circuit containing a single loop, so placed as to be capable of revolving in a magnetic field, as to cut its magnetic flux.

**Single-Magnet Dynamo-Electric Ma-**

**chine.**—A term sometimes used for a single field-coil dynamo.

**Single-Needle Telegraphy.**—A system of telegraphy in which the transmitted signals are received by the movements of a vertical needle suitably suspended before a dial.

**Single-Pair Brush-Rocker.**—A term sometimes used for single-pair brush yoke.

**Single-Pair Brush Yoke.**—A device for so holding a single pair of collecting brushes of a dynamo-electric machine that they can be readily moved or rotated on the commutator cylinder.

**Single-Pair Yoke.**—A single-pair brush yoke.

**Single Peg.**—A peg provided with but a single contact.

**Single Phase.**—(1) Uniphase. (2) Monophase. (3) Pertaining to ordinary alternating currents in a simple alternating-current system as distinguished from multiphase currents.

**Single-Phase Alternating Current.**—A uniphase alternating current.

**Single-Phase Alternator.**—An alternator capable of producing simple or single-phase currents.

**Single-Phase Armature Windings.**—Windings employed on the armature of a single-phase alternator.

**Single-Phase Armature Windings.**—Armature windings of single-phase generators.

**Single-Phase Asynchronous Motor.**—A single-phase alternating-current motor capable of running otherwise than in synchronism with the current supplied to it from the circuit.

**Single-Phase Bar-Armature Windings.**—Such a bar armature winding of an alternator as is capable of producing single-phase currents.

**Single-Phase Dynamo.**—A single-phase alternator.

**Single-Phase Generator.**—A single-phase alternator.

**Single-Phase Motor.**—A uniphase motor.

**Single-Phase Induction Motor.**—An induction motor operated by uniphase currents.

**Single-Phase Induction Motor.**—An induction motor operated or intended to be operated on a single-phase alternating-current circuit.

**Single-Phase Synchronous Motor.**—A synchronous motor capable of being operated by uniphase currents.



**Single-Phase Transformer.**—A transformer suitable for supplying or transforming single-phase currents.

**Single-Phase Winding.**—A single-phase armature winding.

**Single-Phaser.**—(1) An alternating-current generator of single-phase currents. (2) A uniphaser.

**Single-Pole Cut-Out.**—A cut-out by means of which the circuit is broken or cut in one of the two leads only.

**Single-Pole Safety-Fuse.**—A single pole cut-out operated by a safety fuse.

**Single-Pole Switch.**—A switch which opens or closes a circuit at one of its leads only.

**Single-Pole Telephone Receiver.**—(1) A bar-magnet telephone with a coil on one end of the bar. (2) A telephone receiver in which only one magnetic pole is presented to the diaphragm, as distinguished from a receiver in which a pair of poles, each surrounded by a coil, is presented to the diaphragm.

**Single-Pole Telephone Switch.**—A single-pole switch employed on a telephone circuit.

**Single Pull-Off.**—(1) A trolley pull-off supported on a single-curve holder. (2) A single-curve pull-off. (3) A trolley pull-off on a single-track curve.

**Single-Reduction.**—(1) Having but a single gear wheel for reducing speed. (2) A gearing in which but a single reduction of speed takes place as opposed to a double gearing in which two separate reductions are effected.

**Single-Reduction Street-Car Motor.**—A street-car motor which requires a single reduction gear connected with the car axle to reduce the motion of the car axle as opposed to a motor geared with the car axle through two successive gear wheels and therefore one intermediate shaft.

**Single-Reflection Tube.**—A term sometimes applied to an X-ray tube containing but a single deflecting plate or antieathode.

**Single-Shackle Insulator.**—(1) A form of insulator employed in shackling a single wire. (2) A form of single-shackle to which two wires can be fastened at different points and left insulated.

**Single-Shed Insulator.**—An insulator provided with a single inverted cup.

**Single-Stroke Electric Bell.**—An electric bell that gives a single stroke only for each closure of the circuit.

**Single-Throw Switch.**—A switch having but two positions, one for opening, and the other for closing the circuit it controls, as distinguished from a double-throw switch.

**Single-Touch.**—A phrase sometimes employed for magnetization by single touch.

**Single-Track Bracket Trolley-Suspension.**—A form of single-track trolley-wire suspension, in which a bracket is supported from a pole placed on one side of the street.

**Single-Trolley System.**—A trolley system in which a single conducting over-head wire is employed, the track and ground being used for a return.

**Single-Trolley System Electric-Railroad.**—An electric railroad operated by a single trolley.

**Single-Truck Car.**—A car whose body is supported on a single truck.

**Single-Valued Function.**—A function which has only a single value for each value of the variable.

**Single-Wire Cable.**—A cable whose core contains a single conducting wire only.

**Single-Wire Circuit.**—A term sometimes used for a grounded circuit.

**Single-Wire Line.**—A term sometimes used for a single-wire circuit.

**Single-Wire Multiple Telephone Switchboard.**—(1) A single-cord multiple telephone switchboard. (2) A switchboard connecting ground-return subscribers' lines, the jacks of which are all in series in each line.

**Single-Wire Spring-Jack.**—A spring-jack suitable for use in a single-wire switchboard.

**Single-Wire Switchboard.**—(1) A switchboard devoted to the connections of a single line with various sets of apparatus. (2) A telephone switchboard connected to ground return circuits.

**Single-Wire System for Electric Light Leads.**—A term sometimes employed for a ground-return electric light circuit.

**Single-Wire Telephone Switchboard.**—A form of telephone switchboard connecting ground-return circuits.

**Single-Wound Gramme Ring.**—A Gramme ring provided with a single winding, the number of whose coils is a multiple of the number of poles, and the number of whose commutator segments is equal to the number of poles.

**Single-Wound Multiple-Circuit Mul-**

**tipolar Drum-Armature.**—A drum armature wound for a multipolar field in a single winding and affording a plurality of paths or circuits between its brushes.

**Single-Wound Two-Circuit Drum-Armature.**—A drum armature, wound for a multipolar field, with a single winding and affording two conducting paths or circuits between the brushes.

**Single-Wound Two-Circuit Multipolar Ring-Armature.**—A ring armature wound for a multipolar field, with a single winding, which affords but two conducting paths or circuits between the brushes.

**Single-Wound Wire.**—Wire wound or covered with a single layer of insulating material.

**Singly Re-Entrant Armature-Winding.**—(1) A single-winding which re-enters itself. (2) An armature provided with a single-winding which is re-entrant.

**Singular Polarization.**—A term applied to the polarization of a voltaic cell when the depolarizing current is many times stronger than the primary current.

**Sinistrorsal Helix.**—A sinistrorsal solenoid.

**Sinistrorsal Solenoid.**—A solenoid whose winding is left-handed.

**Sinuuous Current.**—A term sometimes applied to a current flowing through a sinuous conductor.

**Sinusoid.**—A name frequently given to a curve of sines.

**Sinusoidal.**—Of or pertaining to a sinusoid.

**Sinusoidal Alternating Electromotive Forces.**—(1) Alternating electromotive forces whose variations in strength are correctly represented by a sinusoidal curve. (2) Simple-harmonic E. M. F.'s. (3) E. M. F.'s which are simple-harmonic functions of time.

**Sinusoidal Alternator.**—An alternator capable of producing sinusoidal electromotive forces.

**Sinusoidal Currents.**—Simple-periodic currents whose strengths are correctly represented by sinusoids.

**Sinusoidal-Current Circuit.**—A circuit conveying sinusoidal currents.

**Sinusoidal Curve.**—(1) A curve of sines. (2) A sinusoid. (3) A curve which to rectangular co-ordinates has an ordinate at each point proportionate to the sine of an angle proportionate to the abscissa.

**Sinusoidal Flux.**—A flux which varies

sinusoidally or according to a simple-harmonic law.

**Sinusoidal Generator.**—A sinusoidal alternator or generator capable of delivering a simple-harmonic E. M. F.

**Sinusoidal Magnetic Flux.**—A sinusoidally varying flux.

**Sinusoidal Magnetomotive Force.**—A magnetomotive force varying sinusoidally.

**Sinusoidal Variation.**—Such a variation of an electromotive force, current, or flux, as may be correctly represented by a sinusoid.

**Sinusoider.**—A name sometimes given to a sinusoidal alternator.

**Siphon, Electric.**—A siphon in which the stoppage of the flow of the liquid due to the gradual accumulation of air, is prevented by electrical means.

**Siphon Recorder.**—An apparatus for recording in ink on a strip of paper a message received over a cable by means of a jet of ink thrown out from a fine glass tube supported on a fine wire.

**Siphon-Recorder Vibrator.**—A device employed in a siphon recorder to obtain the vibrations required for the ejection of the ink from the siphon by mechanical means instead of by electrical means.

**Siphon Writing.**—A record obtained by means of a siphon recorder.

**Siren.**—An acoustic apparatus employed for measuring the frequency of sound waves.

**Six-Pole Dynamo-Electric Machine.**—A sextipolar dynamo.

**Six-Wire System.**—A system of distribution similar in general to the three-wire system, in which five dynamos are connected to six conductors or leads.

**Six-Wire Triphase System.**—A system for the production of triphase currents, in three separate circuits, each having two wires.

**Skew Adjustment of Carbons in Arc Lamps.**—The adjustment of the carbons of an arc lamp by means of which the positive carbon is placed a short distance in front of, but out of the vertical line with the negative carbon.

**Skiagraph.**—A word proposed for radiograph. (Not in general use.)

**Skiasmogram.**—A word proposed for radiograph. (Not in use.)

**Skidding of Car Wheels.**—A term expressing the sliding of the wheels of a car in place of their proper rolling motion.

**Skin Currents.**—A term applied to rapidly alternating currents which are limited to the surface of a conductor.

**Skin Electromotive Force.**—The E. M. F. which is active in producing the skin effect in a conductor.

**Skin Effect.**—The tendency of rapidly alternating currents to avoid the central portions of solid conductors and flow, for the greater part, through the superficial portions.

**Skipping of Pointer of Telegraph Instrument.**—In a dial telegraph, the failure of the dial to point to the letter intended, and caused by its skipping one or more of the letters.

**Skodogram.**—A term proposed for radiograph. (Not in use.)

**Skotograph.**—A term proposed for radiograph. (Not in use.)

**Slack.**—Excess.

**Slack Cable.**—Extra cable, or cable paid out in excess of the distance covered, in order to permit of the subsequent recovery of the cable without undue strain, and also to allow of its accommodating itself to irregularities in the contour of the sea-bottom.

**Sled.**—A sliding contact drawn after a moving railroad car through the slotted conduit containing the wires or conductors from which the driving current is taken.

**Sleeve Joint.**—A junction of the ends of conducting wires obtained by passing them through tubes, and subsequently twisting and soldering.

**Sleeve of Plug.**—A conducting cylinder upon a telephone plug, making contact with the barrel or socket of a telephone jack.

**Slide Bridge.**—A bridge whose proportionate arms are formed of a single thin wire, of uniform diameter and of comparatively high resistance, of some material whose temperature coefficient is low.

**Slide Contact Piece.**—A contact piece in which the circuit is completed by means of a sliding or wiping joint.

**Slide Form of Electric Bridge.**—A slide bridge.

**Slide Resistance.**—(1) A rheostat whose separate resistances or coils are placed in or removed from a circuit by means of a sliding contact. (2) An apparatus employed in telegraphy consisting of a pair of slide rheostats actually subdivided into 100 parts each, but forming jointly a rheostat virtually subdivided into 10,000 parts.

**Slide Switchboard.**—A telephone switchboard in which the connections are made by sliding contacts.

**Slide Wire.**—A wire of uniform diameter employed in Wheatstone's electric bridge for the proportionate arms of the bridge.

**Sliding Bed-Plate.**—A bed-plate of a belt-driven dynamo, motor, or other similar apparatus, provided with means for moving it, so as to tighten the belt.

**Sliding Contact.**—A contact connected with one part of a circuit that closes or completes that circuit by being slid over a conductor connected with another part of such circuit.

**Sliding Contact-Key.**—A key employed in the slide form of Wheatstone's bridge to make contact with the sliding wire.

**Sliding Joint.**—An expansion joint.

**Slings.**—Bright copper wires employed for hanging an object to be electro-plated to the negative rod in the depositing vessel.

**Slinging Wires.**—Erecting wires on aerial poles.

**Slip.**—To release a buoy, rope, anchor etc., in cable work.

**Slip of Induction Motor.**—The proportional difference between the speed of the rotary magnetic field which drives the motor and the speed of the rotor.

**Slip of Rotor.**—The proportional difference between the speed of a rotary magnetic field and the speed of the rotor.

**Slip Thimble.**—In cable work, a device for readily disengaging a buoy from the side of a vessel or from its buoy rope.

**Slippage.**—The ratio, subtracted from unity, of the speed of a rotor divided by the speed of a rotatory magnetic field.

**Slipping of Belt.**—The loss of speed of a revolving belt on its pulley due to slipping.

**Slope of Magneto-Motive Force.**—A term sometimes used for magnetizing force.

**Slope of Potential.**—A phrase sometimes used for drop of potential.

**Slots on Armature Core.**—Slots or grooves provided in an armature core for the reception of the armature coils.

**Slot-Wound Armature.**—(1) An armature in which the windings are buried in slots. (2) An iron-clad armature.

**Slotted Armature.**—(1) An armature provided with slots or grooves for the reception of the wires. (2) An iron-clad armature.

**Slotted Armature-Core.**—An armature core provided with longitudinal grooves.



**Slotted Conduit.**—An underground conduit provided with a slot extending to the surface of the road-bed, through which a travelling conductor can carry off the current from one or more conductors supported in the conduit.

**Slow-Speed Electric Motor.**—(1) An electric motor which is capable of efficient operation at a comparatively slow speed. (2) A motor designed to run at a comparatively slow speed.

**Slow-Speed Generator.**—A generator designed to be run at a slow speed.

**Sluggish Magnet.**—A magnet that acquires or loses its magnetism sluggishly.

**Smashing Point of Incandescent Electric Lamp.**—Such a period in the life of an incandescent lamp which has become blackened, when it will be more economical to break the lamp, or remove it from the circuit and replace it by a new one, than to continue its operation.

**Smee Voltaic Cell.**—A zinc-silver couple employed in connection with an electrolyte of dilute sulphuric acid.

**Smelting of Phosphorus, Electric.**—The electric separation of phosphorus from any of its compounds.

**Smooth-Body Generator.**—A dynamo or generator provided with a smooth-core armature.

**Smooth-Core Armature.**—(1) An armature which presents a continuously smooth cylindrical surface before the armature coils are wound on it. (2) A surface-wound armature as distinguished from an iron-clad armature.

**Snap Switch.**—A switch in which the transfer of the contact points from one position to another is accomplished by a quick motion obtained by the operation of a spring.

**Snap Welding of Rails.**—A welding joint for a rail bond in which the rails are clamped at their short projections, the ends heated as rapidly as possible and then firmly squeezed together when the welding temperature has been reached.

**Snapper.**—A device in a sounding-lead consisting of a pair of metallic jaws which are open when the lead is lowered but which automatically close when the sea bottom is reached, for the purpose of securing samples of the sea bottom.

**Snapper Sounder.**—A mechanical device for producing, by the flexure of a spring, sounds corresponding to Morse characters as heard from a Morse sounder.

**Sneak Current.**—(1) A relatively weak current accidentally introduced into a

telephonic or telegraphic circuit, which would do no immediate harm, but which continuing to circulate in a bell or annunciator coil would generate enough heat in a comparatively short time to burn it out. (2) A current of sufficient strength to be dangerous if maintained, but insufficiently strong to melt the usual safety fuses.

**Sneak-Current Arrester.**—A sneak-current protector or coil.

**Sneak-Current Coil.**—A coil of German-silver wire inserted in a telephone circuit to become sufficiently heated by a sneak-current, or current of dangerous strength, to melt a drop of fusible metal placed within it, and thereby cut the telephone apparatus out of circuit.

**Sneak-Current Protector.**—A form of protector in which a fine fusible wire is inserted between the end of a line and the instruments.

**Snow-Sweeper, Electric.**—A form of snow-sweeper operated by means of an electric motor.

**Soakage.**—A term sometimes employed for residual charge.

**Soaking-In.**—A term sometimes employed for the gradual penetration of an electric charge through a dielectric.

**Soaking-Out.**—A term sometimes employed by telegraphers to represent the gradual discharge which occurs after the first discharge when a charged cable conductor is put to earth.

**Socket.**—(1) In a telephone switchboard a jack or receptacle for a plug. (2) The barrel of a jack, as distinguished from the contact of the jack placed behind the barrel.

**Socket-Base.**—A lamp base provided with means for ready introduction into a lamp socket.

**Socket for Electric Lamp.**—A support for the reception of an incandescent lamp.

**Socket Key.**—A key provided in a lamp socket for lighting or extinguishing the lamp.

**Socket Lamp.**—A lamp provided with a socket.

**Socket Switch.**—A socket key.

**Soft-Drawn Copper Wire.**—Copper wire that is softened by annealing after being drawn.

**Soft Porous Cell.**—A soft baked porous cell, whose use in a voltaic cell renders its internal resistance comparatively low.

**Softness.**—That property of a body in



virtue of which it is readily scratched, or its molecules displaced.

**Solar Telegraph.**—A name sometimes applied to a heliograph.

**Solarisation.**—A term used in photography for the effect produced by exposure to the sun.

**Solder Bar.**—An ear or hanger in a trolley system to which the trolley is secured by solder.

**Soldering, Electric.**—A process for obtaining metallic joints, in which electrically generated heat is employed to melt the solder.

**Soldering Flux.**—Any chemical suitable for use in connection with solder to cleanse the surfaces of the articles to be soldered.

**Soldering Furnace.**—A portable furnace for melting solder and heating soldering irons.

**Solenoid.**—(1) A cylindrical coil of wire whose convolutions are circular. (2) An electro-magnetic helix. (3) Theoretically, a series of coaxial conducting circles placed side by side.

**Solenoid Core.**—A core, usually of soft iron, placed within a solenoid and magnetized by the magnetic flux of the magnetizing current.

**Solenoid Galvanometer.**—A galvanometer whose needle consists of a solenoid core.

**Solenoidal.**—Of or pertaining to a solenoid.

**Solenoidal Blow-Out.**—A magnetic blow-out in which the magnet is a solenoid devoid of an iron core.

**Solenoidal Distribution.**—A space distribution of a vector quantity devoid of convergence.

**Solenoidal Distribution of Magnetism.**—A term sometimes applied to such a distribution of magnetism in a bar that its particles are arranged with their poles in the direction of the length of the bar, the ends of which are of opposite magnetic polarities, and the extent of whose surface is small as compared with the length of the bar.

**Solenoidal Magnet.**—A magnet possessing a solenoidal distribution of magnetism.

**Solid Angle.**—(1) The opening between three or more planes at their point of common intersection. (2) The area of a portion of spherical surface of unit radius as traced by a central radius vector which traces the outline of the solid angle.

**Solid Arc-Light Carbons.**—(1) Carbon electrodes for arc lights unprovided with a core of softer carbon. (2) A carbon

which is of uniform composition throughout as distinguished from a cored carbon.

**Solid-Back Telephone Transmitter.**—A term applied to a form of microphone transmitter, largely employed in long-distance telephony.

**Solid Carbons.**—Solid arc-light carbons.

**Solid Conduit.**—A conduit in which the insulating material is cast or placed around the wires or conductors so that they cannot be removed from the conduit without breaking.

**Solid Depolarizer.**—Any solid substance employed in connection with the negative plate of a voltaic cell for the purpose of effecting its depolarization.

**Solid Thermostat.**—A thermostat whose operation depends on the expansion of a solid, or on the unequal expansion of two different solids.

**Solid Wires.**—Any conductor formed of a single wire, as distinguished from a stranded conductor, or one formed of a number of parallel wires.

**Soluble Electrodes.**—Electrodes employed in metallic electrolysis, made of copper, iron or other metals which are converted into metallic salts during electrolysis.

**Solution.**—A liquid in which a solid, gas or another liquid is dissolved.

**Sonometer.**—A single wire stretched at its ends, provided with a movable bridge for the purpose of determining the relation existing between the frequencies of the successive tones of any gamut.

**Sonometer Interrupter.**—A term sometimes employed in place of electro-dynamic interrupter.

**Sonorescence.**—A word proposed for the sounds produced when a piece of vulcanite, or other solid substance, is exposed to a rapid succession of flashes of light.

**Sonorous.**—Sounding or producing sound.

**Soot Cell.**—In radiophony, a name sometimes given to a carbon cell.

**Sound.**—(1) The sensation produced on the brain through the ear by the vibrations of a sonorous body. (2) The sound waves that are capable of producing a sensation of sound on the brain through the ear.

**Sound Error.**—In telegraphy, an error made by mistaking the sound of a signal, syllable, word or phrase, as distinguished from an error made by mistaking the sight of a written character or word.

**Sound Waves.**—Waves produced in the air or other elastic medium by the vibrations of a sonorous body.

**Sounder Resonator.**—(1) A name sometimes given to a sounder surrounded by a resonant case, for the purpose of increasing the intensity of its sound by resonance. (2) A box-sounding relay.

**Sounding Board.**—An elastic board employed in a stringed musical instrument for the purpose of increasing the intensity of the sounds by resonance.

**Sounding Relay.**—A box-sounding relay.

**Sounding Tube.**—A tube employed in a deep-sea sounding-lead for the purpose of securing a sample of the sea bottom.

**Source, Electric.**—Any arrangement capable of maintaining a difference of potential or electromotive force.

**Southern Light.**—The aurora australis.

**South Magnetic Pole.**—(1) That pole of a magnetic needle which points approximately to the earth's geographical south. (2) The south-seeking pole of a magnetic needle.

**South-Seeking Magnetic Pole.**—The south magnetic pole.

**Spacer.**—In a double-current Morse translator, an electro-magnet in the local circuit, sending zinc, negative, or spacing currents on the circuit to which the current is being delivered.

**Spacing Battery.**—A battery in double-current telegraphy employed to send spacing currents.

**Spacing Current.**—(1) The current employed in automatic telegraphy for the purpose of leaving a space on the recording paper, as distinguished from the marking current, or the current that is intended to record a dot or dash on the paper. (2) In double-current telegraphy, the currents in one direction which effect and correspond to spaces as distinguished from those in the other direction which effect and correspond to marks or signals.

**Spacing of Armature Conductors.**—The pitch of an armature winding.

**Span Cable-Way.**—An overhead cable suspended from poles, and intended for supporting an electric locomotor in a system of electric haulage or telpherage.

**Span Guard-Wire.**—A wire strung across the street over a trolley wire for the purpose of preventing a wire from falling on the trolley wire, as distinguished from running guard wires which overhang and follow a trolley wire along the street.

**Span Wires.**—Wires tightly stretched across a street from pole to pole, for the purpose of supporting trolley wires.

**Span-Wire Hangers.**—The hangers which

suspend the trolley wires from the span wires.

**Span-Wire Trolley Line Construction.**—A method for the suspension of an aerial trolley line, in which the trolley and feed wires are suspended from span wires supported on poles placed opposite to one another on each side of the street or road.

**Spanish Spoon.**—A name given to a form of shovel employed for lifting soil out of a hole in the ground excavated for a telegraph pole.

**Spar Torpedo.**—A torpedo attached to the end of a spar and designed to be exploded by percussion against the side of an enemy's vessel when thrust against it.

**"Spare" Machine.**—An extra dynamo, motor or other machine reserved in an installation for use in case of accidental break down.

**Spark Arrester.**—A device for preventing an arc lamp from scattering sparks or particles of incandescent carbon.

**Spark Chronograph.**—A form of electric chronograph in which the record is made of the time of a certain event by means of a spark from a Ruhmkorff or spark coil.

**Spark Coil.**—A coil of insulated wire connected with the main circuit in a system of electric gas lighting, whose extra spark produced on breaking the circuit is employed for electrically igniting gas jets.

**Spark Discharge.** (1) An electric discharge effected by a spark. (2) A disruptive discharge.

**Spark, Electric.**—A term sometimes applied to a disruptive discharge. (2) The phenomena produced by a disruptive discharge in the air-space or gap through which the discharge passes.

**Spark Gap.**—(1) The air-space or gap through which a disruptive discharge passes. (2) A gap forming part of a circuit between two opposing conductors and filled with air or other dielectric, across which a spark passes when a certain difference of potential has been reached.

**Spark Micrometer.**—A spark gap capable of delicate adjustment and measurement.

**Spark Tube.**—A high-vacuum tube across which the spark from an induction coil will not pass, if the vacuum is sufficiently high.

**Sparkling.**—Discharging by means of disruptive sparks.

**Sparkling Discharge.**—A disruptive discharge.

**Sparking Distance.**—The distance through which electric sparks will pass across an intervening air-gap.

**Sparking of Dynamo-Electric Machine.**—An irregular and injurious operation of a dynamo attended with sparks at its collecting brushes.

**Sparking Terminals.**—(1) The terminals of a spark-gap. (2) The points or ends of a spark-gap.

**Sparkless Commutation.**—Commutation of a dynamo accomplished without sparking at the brushes.

**Spasmodic Governor.**—A name given to a form of governor for electric motors, in which the current is automatically cut off in proportion as the work is cut off.

**Speaking Battery.**—In telegraphy or telephony, the battery employed for speaking or signalling.

**Speaking Key.**—(1) In telegraphy, a key employed in speaking. (2) A signalling key as distinguished from a testing key.

**Speaking Mirror.**—A simple form of mirror galvanometer employed in cable telegraphy for the reception of the current impulses or signals.

**Speaking Mirror Plug.**—A closed tube or plug for insertion into a speaking mirror instrument, and containing a suspended mirror and magnet.

**Speaking Switch.**—In telegraphy, a switch employed in speaking or signalling.

**Speaking Telegraph.**—A term sometimes employed for the telephone.

**Speaking Telegraphy.**—A term sometimes employed for telephony.

**Speaking-Tube Annunciator.**—An oral annunciator.

**Speaking-Tube Mouth-Piece Alarm, Electric.**—A mouth-piece for a speaking-tube, so arranged that the movement of a pivoted plate covering the mouth-piece automatically rings an electric bell at the other end of the tube.

**Speaking-Tube Telephone System.**—A name sometimes employed for a system of telephone communication by means of which a number of offices can be connected without the use of a central switch-board.

**Speaking Wire.**—In a system of telephony, a wire connecting two exchanges for the purpose of communicating instructions between operators, as distinguished from a wire through which a subscriber may be connected.

**Specific Capacity.**—Specific inductive capacity.

**Specific Conductance.**—A term sometimes used for specific conductivity.

**Specific Conduction Resistance.**—(1) Resistivity. (2) A term sometimes used for specific resistance.

**Specific Conductivity.**—(1) The particular conductivity of a substance for electricity. (2) The specific or particular resistance of a given length and area of cross-section of a substance, as compared with the same length and area of cross-section of some standard substance. (3) Conductivity with reference to Matthiessen's standard conductivity.

**Specific Dielectric Capacity.**—A term sometimes employed in place of specific inductive capacity.

**Specific Energy.**—(1) Volumetric energy. (2) Energy per unit of volume.

**Specific Gravity.**—The weight of a given volume of a substance, as compared with an equal volume of some standard substance, such as water.

**Specific Heat.**—The capacity of a substance for heat, as compared with an equal quantity of some other substance taken as unity.

**Specific Heat of Electricity.**—A term proposed to indicate the analogies existing between the absorption and emission of heat in purely thermal phenomena, and the absorption and emission of heat in thermo-electric phenomena.

**Specific Hystoretic Dissipation.**—

(1) The loss of energy by hysteresis in a particular substance, per unit of volume. (2) The hysteric loss of energy in a substance under given conditions compared with the similar loss in a standard substance.

**Specific Inductive Capacity.**—(1) The ability of a dielectric to permit induction to take place through its mass as compared with the ability possessed by a vacuum space of the same dimensions, under precisely the same conditions. (2) The relative power of bodies for transmitting electrostatic stresses and strains, analogous to permeability in metals. (3) The ratio of the capacity of a condenser whose coatings are separated by a dielectric of a given substance, to the capacity of a similar condenser whose plates are separated by a vacuum. (4) The ratio of the permittivity of a substance to the permittivity of vacuum.

**Specific Magnetic Capacity.**—(1) A term sometimes employed in the sense of magnetic permeability. (2) A word employed for conductivity for magnetic



flux, in the same sense that specific capacity is conductivity for electrostatic flux.

**Specific Magnetic Conductivity.**—The specific or particular permeability of a substance to magnetic flux.

**Specific Magnetic Inductivity.**—A term sometimes used for specific magnetic conductivity.

**Specific Magnetic Reluctance.**—A term sometimes used for specific magnetic resistance.

**Specific Magnetic Resistance.**—A term sometimes used for reluctivity.

**Specific Magnetism.**—A term proposed for the quotient of the magnetic moment of a magnet by its mass.

**Specific Molecular Conductivity.**—Molecular conductivity as referred to that of some standard substance.

**Specific Reluctance.**—A term sometimes used for reluctivity.

**Specific Resistance.**—(1) The particular resistance a substance offers to the passage of electricity through it, compared with the resistance of some standard substance. (2) In absolute measurements, the resistance in absolute units between opposed faces of a centimetre cube of a given substance. (3) In the practical system, the above resistance in ohms. (4) Resistivity, expressed in electro-magnetic absolute units as square-centimetres per second.

**Specific Resistance of Liquid.**—(1) The resistance of a given length and area of cross-section of any liquid as compared with the resistance of an equal length and cross-section of pure copper or other standard conductor. (2) Resistivity of a liquid.

**Spectrograph.**—A word proposed for radiograph.

**Spectrophone.**—An instrument employed for the exploration of the ultra red portion of the spectrum.

**Spectro-Photometer.**—(1) A form of photometer suitable for measuring the relative intensities of lights of different qualities. (2) A photometer which compares luminous intensities in successive portions of spectra, frequency by frequency. (3) A spectroscope so arranged as to readily permit of the comparison as to brightness, wave-length by wave-length, of rays from two different luminous sources.

**Spectro-Photometric.**—Of or pertaining to the spectro-photometer.

**Spectro-Photometry.**—Photometry by means of the spectro-photometer.

**Spectroscope.**—An optical instrument for determining the composition of a body by the character of the light it emits, as determined by its component frequencies.

**Spectroscopic.**—Of or pertaining to the spectrum.

**Spectrum.**—A band of multicolored light or radiant energy of different frequencies, obtained by dispersion in a prism or by a diffraction grating.

**Speed Constant.**—In submarine telegraphy, a constant quantity which divided by the product of the capacity and resistance of a cable gives the working speed of the cable in letters per minute.

**Speed Counter.**—Any apparatus for determining the number of revolutions of a shaft.

**Speed and Direction Indicator.**—A telegraph on board ship for indicating the speed of revolution of the propeller shaft and the direction of its movement.

**Speed Indicator.**—A form of speed counter.

**Speed of Rotation.**—(1) The number of revolutions per second, per minute, hour or unit of time generally. (2) The distance passed over in a given time by the circumference of a rotating wheel or pulley. (3) The angular velocity of rotation in degrees or radians per unit of time.

**Speed Recorder.**—(1) An apparatus for recording the instantaneous values of the speed of any machine. (2) An instrument for both indicating and recording the speed of a trolley car from moment to moment.

**Speeding.**—(1) Varying the number of revolutions per second. (2) Increasing a speed of rotation.

**Speeding of Dynamo.**—Varying the speed of a dynamo, for the purpose of obtaining the proper speed required to operate an electro-receptive device placed in its circuit.

**Spelter.**—A name sometimes given to commercial zinc.

**Spont Acid.**—A battery or other acid that has, through use, become too weak for efficient action.

**Spent Liquor.**—Any liquor such as that used in an acid or other bath, that has through use become too weak for efficient action.

**Spewing of Cable Core.**—The mechanical derangement of a cable, whereby the sheathing opens and the core appears on the surface.



**Spherical Aberration.**—A defect whereby a lens or mirror with spherical faces fails to produce in its images the correct outlines of objects, owing to the fact that the curvature of one or both of its faces should slightly depart from the true spherical form in order to produce a true image.

**Spherical Armature.**—An armature for a dynamo, the coils of which are wound on a spherical iron core.

**Spherical Bougie Decimale.**—(1) A unit of luminous flux equal to that which would be produced by a point source having an intensity of one bougie decimale in all directions. (2) A luminous flux equal to 12.566 lumens.

**Spherical Candle-Power.**—(1) The total flux of light emitted by a luminous source divided by 12.566. (2) The candle-power of a point-source, which emits with uniform intensity in all directions, as much light as does an actual lamp. (3) The average candle-power of a luminous source taken in all directions, or considered over the entire surface of an enveloping sphere.

**Spherical Candle-Power Measurer.**—An instrument for measuring, or enabling to be measured, the mean spherical candle-power of a source of light from a single observation.

**Spherical Candle-Power Photometer.** (1) A photometer designed to measure the mean spherical candle-power of a lamp. (2) A photometer designed to measure the mean spherical candle-power of a luminous source from a single observation.

**Spherical Harmonics.**—Homogeneous functions of rectilinear space-co-ordinates which satisfy Laplace's equation.

**Spherical Strain Insulator.**—An insulator for a guy-wire or trolley pull-off, spherical in form.

**Spherometer.**—An apparatus for readily measuring the curvature of a sphere.

**Sphygmogram.**—A record made by a sphygmograph.

**Sphygmograph.**—An instrument for recording the movements of the pulse, usually of the radial artery at the wrist.

**Sphygmograph, Electric.**—An instrument for electrically recording the peculiarities of the pulse.

**Sphygmophone.**—An apparatus employing a microphone for the medical examination of the pulse.

**Sphygmoscope.**—An apparatus for detecting, but not recording, the peculiarities of the pulse.

**Spider.**—A radial bracket or support for supporting an armature or machine on a revolving shaft.

**Spider Arm.**—One of the projections of a spider support.

**Spin.**—(1) The curl of a vector point-function. (2) Rotation. (3) Vorticity.

**Spiral.**—(1) A helix. (2) A word sometimes employed in electricity and magnetism for an open conducting coil.

**Spiral Accumulator.**—An accumulator whose plates consist of two parallel plates of lead insulated from each other and rolled into a close spiral.

**Spiral Loop System of Parallel Distribution.**—A modified form of loop system for parallel distribution.

**Spiral Loop System of Distribution.**—A name given to a variety of parallel distribution adopted for obtaining a comparatively uniform distribution of potential, in which the parallel conductors are extended in the arcs of spirals from the generating station throughout the district to be served, both spirals extending from one pole of the generator nearly to the other pole.

**Spiral Winding.**—A solenoidal winding.

**Spiralled Pairs of Cable.**—A defect in the winding of a telephone cable, in which any four wires are so wound about the core that one pair is not on the average midway between the other pair, so that cross-talk is sure to result.

**Splice Bar.**—A fish plate employed for connecting together the ends of a rail.

**Splice Box.**—A box provided for holding splice joints and loops so arranged as to be readily accessible for examination, rearrangement, cross-connection, etc.

**Splicing.**—Connecting the sheathings of the two ends of a cable at a joint.

**Splicing Ear.**—(1) A trolley ear for uniting the ends of a trolley wire. (2) A splicing suspension ear.

**Splicing Mallet.**—A mallet used in a submarine cable splice for laying on a serving of yarn under tension.

**Splicing Sleeve.**—A tube of conducting material employed for covering a splice in a conducting wire.

**Splicing Suspension Ear.**—A metal piece suitably supported on an insulator and provided in a system of overhead trolley wires for connecting two separate ends of the trolley line.

**Splicing Tool.**—A tool employed in making a cable splice, for forcing the sheave wires around the cable in their

proper spiral position corresponding to that which they have on other parts of the cable.

**Splicing Tube.**—A name sometimes given to a connector employed in making a joint in a trolley wire.

**Split Battery.**—A voltaic battery connected in series and having one of its middle-plates connected to the ground.

**Split Condenser.**—(1) A condenser so arranged that its different sections can be readily inter-connected in the same circuit or employed in different circuits as may be required. (2) A subdivided condenser.

**Split Current.**—(1) A divided current. (2) A current tapped from a main telegraph wire.

**Split Dynamometer.**—A dynamometer employed in connection with alternating currents provided with two coils, so arranged that separate currents of the same frequency can be passed independently through each.

**Split Lead-Tee.**—A T-shaped lead tube that is split for readily covering a joint at a branch in a cable.

**Split Phase.**—A difference produced between the phases of two or more alternating currents into which a uniphase alternating current has divided.

**Split-Phase Motor.**—(1) A multiphase motor operated from a uniphase alternating-current circuit by the introduction of a phase-splitting device. (2) A multiphase motor in which the multiphase currents are locally produced from a single-phase circuit.

**Split-Pin Plug.**—A plug having two halves or two sleeves insulated from each other, employed for readily introducing a loop into a circuit.

**Split-Ring Magnet.**—A ring-core magnet provided with an air-gap.

**Split-Secondary of Induction Coil.**—The secondary of an induction coil which is divided into two equal portions.

**Spluttering of Arc.**—A spluttering sound attending the formation of a voltaic arc.

**Spokes of Armature Core.**—Radial projections on a spider in an armature core, on which coils are sometimes wound.

**Sponge Electrode.**—A therapeutic electrode provided with a sponge.

**Spontaneous Electricity.**—A term formerly employed for the electricity produced by the melting of sulphur.

**Spot.**—The reflected image or luminous

patch of light on a mirror galvanometer scale.

**Spotty Filament.**—The filament of an incandescent lamp possessing such local variations in resistance that when rendered luminous by the passage of the current, it possesses points of unequal brilliancy.

**Spreader Bracket.**—A name sometimes given to a loop bracket.

**Spreader for Arc Wires.**—A form of loop bracket employed on arc circuits.

**Spreading of Magnetic Field.**—A term sometimes employed for divergence of a magnetic field.

**Sprengel Mercury Pump.**—A mercurial air pump in which the vacuum is obtained by means of the fall of a stream of mercury through a tube in such a manner as to entangle portions or bubbles of residual air.

**Spring Ammeter.**—A form of ammeter in which a magnetic core or needle is moved against the action of a spring by the field of the current it is measuring.

**Spring Clips of Switch.**—Spring jaws of a switch which grasp the blade or blades in the closed position.

**Spring Contact.**—(1) A contact which either opens or closes under the action of a spring. (2) A spring-supported contact, connected with one part of a circuit, that completes the circuit on being moved so as to touch another contact connected with the other part of the circuit. (3) A circuit-closing or circuit-opening device normally maintained in one position and condition by the action of a spring.

**Spring Dynamometer.**—A dynamometer whose operation is dependent on the action of a spring.

**Spring Jack.**—A form of spring contact provided with a hole for the insertion of a plug.

**Spring-Jack Cut-Out.**—A cut-out operated by a spring jack.

**Spring-Jack Telephone Switchboard.**—A form of telephone switchboard provided with calling drops, clearing out drops, and spring jacks, so arranged as to readily enable a number of subscribers to be placed in inter-communication.

**Spring Manometer.**—A manometer whose operation is dependent on the deformation of an elastic solid.

**Spring Relay-Contact.**—A form of relay contact which is interrupted by the action of a spring as soon as the circuit is broken.

**Spring-Snap Lever-Switch.**—A form of switch operated by a spring snap lever.

**Spring-Suspended Street-Railway Motor.**—A street-railway car motor suspended from the car truck by means of springs.

**Spring Voltmeter.**—A form of voltmeter in which the potential difference is measured by the movement of a magnetic needle, coil, or core, against the pull of a spring.

**Spurious Hall Effect.**—An apparent transverse electromotive force in conductors carrying electric currents in magnetic fields, by changes produced by magnetism, in the conductivity of the metals and the consequent production of local disturbances in the electrical flow, thus resulting in an apparent transverse electromotive force.

**Spurious Resistance.**—A false or apparent resistance arising from the development of a counter-electromotive force.

**Square Conductor.**—A form of power conductor with rectilinear cross-section.

**Square Mil.**—(1) A unit of area employed in measuring the areas of cross-section of wires, equal to .000001 square inch. (2) A unit of area equal to 1.2732 circular mils.

**"Squeeze."**—In electro-typing the impression obtained by subjecting a type, or woodcut, to a plate or mass of soft wax.

**Squeezer.**—A device for testing the ductility of a wire, consisting in a receptacle, somewhat resembling a lemon squeezer, in which the wire is placed and clamped and the device opened and closed until the wire breaks.

**Squirted Filament.**—A filament for an incandescent lamp made by the carbonization of a carbonaceous paste, that is shaped by being squirted by pressure through a suitably shaped die hole.

**Stable Galvanization.**—A term employed in electrotherapeutics in which the current is caused to pass continuously and steadily through the portions of the body undergoing galvanization.

**Stable Equilibrium.**—(1) The equilibrium of a body supported on a base, such that in order to overturn it, its centre of gravity must be raised. (2) The equilibrium of a body so supported that any small displacement raises its centre of gravity.

**Stable Period of Circuit.**—(1) That condition of a circuit in which the current passing through it has reached its

full strength, and is no longer undergoing variations. (2) The permanent state.

**Stage Regulator.**—A controller of incandescent lamps in a theatre, placed near the stage, whereby they may be lighted, extinguished, or dimmed.

**Staggered Armature.**—An armature in which the conductors do not lie on its surface in a direction parallel to the axis of rotation, but cross its surface diagonally.

**Staggering of Dynamo Brushes.**—A term sometimes applied to the position of the brushes on a commutator cylinder, in which one brush is placed slightly in advance of the other, so as to wear the commutator surface smoothly, and prevent the formation of grooves.

**Stalk of Insulator.**—The support or inner metal cylinder of an aerial line insulator.

**Standard.**—A metallic pole supported on the roof of a house for carrying overhead wires.

**Standard Candle.**—(1) A candle of definite composition, which, when burned at the rate of two grains per minute, will produce a light of a definite and fixed brightness. (2) A legal standard of light in Great Britain.

**Standard Cell.**—A standard voltaic cell.

**Standard Clock.**—A clock employed for the comparison of other clocks.

**Standard Coil.**—A standard resistance coil.

**Standard Compass.**—A compass on board ship which is used as a standard and by which other compasses may be checked or compared.

**Standard Cross-Arms.**—Wooden cross-arms of standard dimensions for supporting aerial wires on poles.

**Standard Earth-Quadrant.**—(1) A length approximately equal to 10,000 kilometres. (2) One quarter of the meridian circle of the earth taken through Paris. (3) A standard unit of inductance.

**Standard Feeder.**—A term sometimes applied to a principal feeder, operated at standard pressure.

**Standard Luminous Intensity.**—(1) Any unit of luminous intensity employed as a standard. (2) A luminous intensity of one *violette bougie-decennale*, Hefner-Alteneck, carcel, British standard candle, etc.

**Standard Megohm.**—A resistance equal to one million ohms, employed as a standard.

**Standard Ohm.**—A length of wire having



a resistance of the value of one ohm, employed in standardizing resistance coils.

**Standard Quadrant.**—(1) The standard earth quadrant. (2) A standard inductance equal to one quadrant.

**Standard Resistance.**—A known resistance used for comparison with, or determination of, an unknown resistance.

**Standard Resistance Coil.**—A coil whose resistance is that of a standard ohm or some multiple or sub-multiple thereof.

**Standard Telephone Switchboard.**—A name applied to a form of multiple switchboard commonly employed in the United States.

**Standard Time.**—Mean solar time used in telegraphy, and referred either to the meridian of Greenwich, or to some other meridian west of Greenwich, an exact number of hours.

**Standard Voltaic Cell.**—A voltaic cell whose electromotive force is practically constant, and which can, therefore, be used as a standard in the measurement of an unknown electromotive force.

**Standard Wire Gauge.**—A wire gauge adopted by the National Telephone Exchange Association and the National Electric Light Association of America.

**Standards.**—(1) Telegraphic or telephonic supports placed on the roof of a building for the purpose of supporting the wires or conductors. (2) A general term for a resistance coil, voltaic cell or other standard employed for purposes of comparison. (3) A term applied to the support of the bearings of a dynamo or motor.

**Standardized Resistance Coil.**—A coil whose resistance has been carefully obtained by comparison with a standard.

**Standardizing a Voltaic Cell.**—Determining the exact value of the electromotive force of a voltaic cell, in order to permit it to be used as a standard in obtaining the electromotive force of any electric source.

**Standing Torque.**—Starting torque.

**Star Current in Polyphase System.**—(1) A current between any line or terminal of a polyphase system and the neutral point. (2) The current in any branch of a star polyphase system.

**Star Grouping of Polyphase Circuits.**—A method of grouping a triphase circuit consisting of making a common junction at one point and branching them star-wise.

**Star Potential in Polyphase System.**—The effective difference of potential or

voltmeter pressure between any line or terminal of a polyphase system and the neutral point.

**Star Triphase-Winding.**—A connection of three triphase windings in which all three are connected together at a common point or junction point, and the three free ends connected to the terminals.

**Star Triphaser.**—A triphaser possessing a star triphase winding.

**Starting Box.**—A name sometimes applied to a starting resistance.

**Starting Box for Electric Motor.**—A resistance provided for starting an electric motor.

**Starting Box of Shunt-Wound Motor.**—A box provided with a rheostat of variable resistance, introduced into the armature circuit of a shunt-wound motor for the purpose of preventing the rush of current made on first connecting the motor with the driving-circuit.

**Starting Coil of Motor.**—A coil employed as a starting resistance for an electric motor.

**Starting Current of Motor.**—The current traversing the coils of a motor at its moment of starting.

**Starting Motor for Synchronous Motor.**—A small electric motor sometimes employed for bringing the armature of a synchronous single-phase motor up to its proper speed before connecting it with the driving-current circuit.

**Starting Position of Street-Car Controller.**—(1) The position of a street-car controller switch at which the current is cut off from the motors. (2) The position of a street-car controller switch, at which the current is first admitted to the motors when starting.

**Starting Resistance.**—A resistance employed in the starting box for an electric motor.

**Starting Rheostat.**—Coils of wire mounted in a suitable manner, and so connected as to be successively placed in the circuit of a motor while it is being started.

**Starting Torque of Motor.**—(1) The torque required in starting a motor. (2) The torque developed by a motor in starting.

**Static Balance.**—A duplex or quadruplex balance adjusted for the capacity of a line by the use of a condenser.

**Static Balance of Duplex System.**—(1) The capacity balance of a duplex system as distinguished from the resistance balance. (2) A balance for charging and



discharging as distinguished from a balance for steady currents.

**Static Breeze.**—An electric breeze obtained by a convective discharge or an electrostatic discharge.

**Static Compensating Condenser.**—A condenser employed in the artificial line of duplex or quadruplex telegraphy.

**Static Compensator.**—A condenser employed for compensating the electrostatic capacity of a line in the duplex system.

**Static Discharge.**—A name sometimes given to a disruptive discharge.

**Static Electricity.**—A term applied to electricity produced by friction.

**Static Electro-Motor.**—An electro-motor operated by the repulsion of electric charges.

**Static Energy.**—(1) A term used to express the energy possessed by a body at rest, resulting from its position as regards other bodies, in contradistinction to kinetic energy, or the energy possessed by a body whose atoms, molecules and masses are in actual motion. (2) Potential energy.

**Static Hysteresis.**—(1) A term sometimes applied to that quality in iron or other paramagnetic substance, by virtue of which energy is dissipated during every reversal in its magnetization, in contradistinction to viscous hysteresis. (2) Electrostatic dielectric hysteresis.

**Static Induction.**—A term sometimes employed for electrostatic induction.

**Static Insulation.**—A term employed in electro-therapeutics for a mode of treatment by convection streams or discharges, in which the patient is seated on an insulated stool connected to one pole or electrode of an influence machine, while the other pole or electrode is connected to the ground.

**Static Magnetic Induction.**—The induction which takes place in the field of a magnet whose flux is stationary as regards the body in which the induction is occurring.

**Static Shock.**—(1) A term employed in electro-therapeutics for a mode of applying Franklinic currents or discharges by placing the patient on an insulating stool and applying one pole of a static machine provided with small condensers or Leyden jars, while the other pole is connected to the body of the patient. (2) An electrostatic shock.

**Static System of Induction Telegraphy.**—A system of induction telegraphy depending on static induction be-

tween the sending and the receiving instrument.

**Static Time Constant.**—The electrostatic time constant of a circuit.

**Static Transformer.**—A term sometimes employed for an ordinary transformer, to distinguish it from a rotary transformer.

**Static Voltmeter.**—(1) A voltmeter operating by electrostatic action, as opposed to a voltmeter operating electro-magnetically. (2) A voltmeter in which the moving system is displaced by electrostatic forces. (3) A voltmeter of the electro-scope or electrometer type.

**Statics.**—(1) That branch of science which treats of the relations that must exist between the points of application of forces and their direction and intensity, in order that equilibrium may result. (2) The science of forces at rest.

**Station Circuit - Breaker.**—A circuit-breaker in a central station.

**Station Indicator.**—(1) A name sometimes given to a station voltmeter. (2) Any indicator situated at a central station.

**Station Load.**—The total load existing on a central station at any time.

**Station Load-Curve.**—A curve representing the station load at different times.

**Station Panel.**—(1) A panel in a central-station switchboard. (2) A load panel in a central-station switchboard showing the total load of the station. (3) A panel in a central-station switchboard connecting a feeder running to some other station or sub-station.

**Station Recording-Wattmeter.**—A wattmeter suitable for use in a central station for recording the energy delivered by the station.

**Station Switch.**—(1) A switch in a station. (2) A switch for connecting an auxiliary station to a system. (3) A switch supplying an auxiliary station. (4) A switch for connecting the lighting or other local wires in a central station to the system of distribution.

**Station Transformer.**—(1) A transformer placed in a central station. (2) A transformer which supplies a load in a station. (3) A transformer intended to supply current to lamps and potential indicators on the switchboard in the station.

**Stationary Transformers.**—A word sometimes applied to ordinary alternating-current transformers, in contradistinction to rotary transformers.

**Stationary Electric Motor.**—An electric motor that is fixed to the floor or ground, in contradistinction to a travelling or locomotor.

**Stationary Fare-Register for Street Car.**—A register placed permanently in a car, for the purpose of recording the fare received by a conductor.

**Stationary Floor-Key.**—A name sometimes applied to a floor push.

**Stationary Hook of Telephone.**—A fixed hook provided for holding a telephone.

**Stationary Motor.**—A motor that is fixed in place, in contradistinction to a locomotor.

**Stationary Secondary of Induction Motor.**—An induction motor whose secondary coils form the stator.

**Stationary Tachometer.**—Any tachometer employed for indicating the number of revolutions per minute of a shaft in a stationary rotating machine.

**Stationary Torpedo.**—A term sometimes employed for a submarine mine.

**Stator.**—That part of a dynamo or motor, whether the armature or the field, which remains at rest or stands still during the operation of the machine, as distinguished from the rotor or part which rotates.

**Stator Armature.**—(1) An armature of a dynamo or motor that remains at rest during the operation of the machine. (2) An immovable element of a machine which is also its armature.

**Stator Circuit.**—The circuit of the stator coils.

**Stator Coils.**—The coils placed on the stator of a dynamo or motor.

**Stator Currents.**—Currents that flow in the stator of a dynamo or motor.

**Stator Field.**—A field of a dynamo or motor that remains at rest during operation.

**Statute Mile.**—A length employed in Great Britain equal, by statute, to 5280 feet.

**Stauroscope.**—A form of polariscope for investigating the effects of polarized light on crystals.

**Stay-Eye Clip.**—An iron band rigidly clamped to roof beams or other strong supports and carrying an iron ring for the attachment of a stay-rod.

**Stay Rod.**—A rod of iron or steel, used to stay or support a telegraph or telephone pole.

**Stay Tightner.**—A swivel for taking up slack in a stay.

**Steady Current.**—A current whose strength does not vary from time to time.

**Steam Dynamo.**—(1) A name applied to a steam-turbine dynamo. (2) A dynamo direct-connected to a steam engine.

**Steam Governor, Electric.**—A device used in connection with a valve to so electrically regulate the supply of steam to an engine that the engine shall be driven at such a speed as will maintain either a constant current, or constant potential.

**Steam-Turbine Dynamo.**—A high-speed dynamo whose armature is driven by means of a steam turbine.

**Steaming Lights, Electric.**—A term sometimes applied to the side lights of a ship.

**Stearn's Relay Shunt.**—A shunt employed in the differential method of duplex telegraphy to short-circuit the relay and then permit the line current to be cut off directly after it has completed its work in closing the local circuit.

**Steel Facing of Electro-Type.**—A thin electrolytic deposit of iron placed on the surface of an electro-type for the purpose of hardening it.

**Steel-Yard Ammeter.**—A form of ammeter in which the strength of a current is measured by means of the electro-magnetic forces applied to one extremity of a steel-yard lever, provided with sliding weights for balancing these forces.

**Steeps.**—A word sometimes employed in electro-plating for dips or dipping liquids or solutions.

**Steering Compass.**—A compass employed for the steering of a ship.

**Steering, Electric.**—Steering effected electrically.

**Steering Telegraph.**—A telegraph on board ship for communicating steering orders from some point such as the bridge or conning tower.

**Steno-Telegraphy.**—A system of telegraphy in which the sounds of a word are represented by characters instead of by letters.

**Step-by-Step Annunciator.**—An annunciator operated on the step-by-step principle.

**Step-by-Step Telegraphy.**—(1) A system of telegraphy in which the signals are registered by the movements of a needle over a dial on which the letters of the alphabet are marked. (2) Dial telegraphy.

**Step-Down Converter.**—A step-down transformer.

**Step-Down Transformer.**—(1) A transformer in which a small current of comparatively great difference of potential is converted into a large current of comparatively small difference of potential. (2) An inverted Ruhmkorff induction coil.

**Step-Up Converter.**—A step-up transformer.

**Step-Up Transformer.**—A transformer in which a large current of comparatively small difference of potential is converted into a small current of comparatively great difference of potential.

**Steradian.**—(1) A unit of solid angle. (2) The solid angle subtended at the centre of a sphere of unit radius by a unit of spherical area, or unit of surface on the sphere.

**Stereopticon.**—A lantern apparatus for projecting on a screen a stereoscopic picture.

**Stereoscope.**—An optical apparatus for obtaining from two photographic pictures, taken in slightly different positions, pictures correctly representing solid objects.

**Stereoscopic.**—Of or pertaining to a stereoscope.

**Stereotype.**—A fac-simile or duplication of a page of movable types or of engravings, effected by obtaining a moulding of the original in some suitable material, and then immersing the mould in melted type metal.

**Sterilization, Electric.**—Sterilizing a solution by depriving it, by means of electric currents, of whatever germs it may contain.

**Stern Sheave.**—(1) A large sheave on the stern of a cable-ship for paying out cable. (2) Any sheave at the stern of a boat or vessel used in paying out cable.

**Stethoscope.**—An instrument for ascertaining the condition of the organs of circulation and respiration by the sounds they produce.

**Sticking.**—(1) A name given by telegraphers to the failure of a relay armature to leave the magnet pole and break contact on the cessation of the current. (2) Undue adhesion between the contacts of a relay.

**Sticking of Magnetic Armature.**—The adherence of the armature of any electro-magnet to its poles after the current has ceased to pass through the magnetizing coils.

**"Stiff Field."**—A magnetic field of comparatively high density.

**Stilography.**—A modified form of glypography.

**Stimulus of Nerve, Electric.**—The effect which electricity produces by its passage through a nerve.

**Stock Ticker.**—A step-by-step printing telegraphic instrument, employed in transmitting stock quotations to brokers' offices from stock exchanges.

**Stock-Ticker Service.**—A term employed for the transmission of stock quotations from stock exchanges to subscribers.

**Stoneware Dipping-Bowl.**—A perforated bowl made of stoneware, in which articles are placed that are to be subjected to the dipping process in electro-metalurgy.

**Stoneware Dipping-Basket.**—A stoneware dipping bowl.

**Stopped-Off.**—Subjected to the stopping-off process.

**Stopper Incandescent Lamp.**—An incandescent lamp in which the mounted filament, instead of being hermetically sealed in the lamp chamber, is placed therein by means of a tightly fitting stopper.

**Stopper Lamp.**—A stopper incandescent lamp.

**Stopping-Off.**—A process employed in electro-plating, in which a metallic article, already electro-plated over its entire surface, is electro-plated with another metal over certain parts only.

**Stopping-Off Process.**—A process employed in electro-plating by means of which an article which is to be electro-plated on portions of its surface only with one metal, and on other portions with another metal, is first completely covered by an electro-plating of the cheaper metal, and then stopped-off by covering, with a coating of non-conducting varnish, such portions only of its surface as are not to receive the deposit of the more precious metal.

**Stopping-Off Varnish.**—A varnish used in electro-plating to cover portions which are not to receive the metallic coating.

**Stopping-Out Process.**—A process employed in electro-typing, by means of which those parts of an electro-type mould that are not to be copied in the electro-type are covered with clean hot wax.

**Storage Accumulator.**—A term sometimes used for storage battery.



**Storage Battery.**—A number of separate storage cells connected so as to form a single electric source.

**Storage-Battery Car.**—An electric car which carries the storage battery employed for its propulsion.

**Storage-Battery Meter.**—A meter connected with a storage battery for the purpose of indicating the electric quantity, or energy, left in the same.

**Storage-Battery Traction.**—Electric car traction obtained by means of storage batteries.

**Storage Capacity.**—The capacity of a storage battery, as measured in ampere-hours.

**Storage Cell.**—(1) Two relatively inert plates of metals or metallic compounds immersed in an electrolyte incapable of acting on them until after an electric current has been passed through the liquid from one plate to the other, and has thus changed their chemical relations. (2) One of the cells required to form a secondary battery. (3) A term sometimes given to the jar containing a single cell.

**Storage-Coil Tester.**—A convenient form of electrode provided for ready attachment to the individual cells of a storage battery, for the purpose of ascertaining their electromotive forces from time to time.

**Storage of Electricity.**—A term improperly employed to indicate such a storage of energy as will enable it to directly reproduce electric energy.

**Storage of Energy.**—The change from any form of kinetic energy to any form of potential energy.

**Storm, Electric.**—(1) Any unusual condition of the atmosphere as regards the quantity or distribution of its free electricity. (2) A thunder storm.

**Stove-Plate, Electric.**—An electrically heated stove-plate.

**Straggling Flux.**—Leakage flux.

**Straight Connector.**—A connector for coupling two wires in the same straight line.

**Straight-Filament Incandescent Lamp.**—An incandescent lamp provided with a straight filament.

**Straight-Line Insulator.**—An insulator employed for a trolley line, where the conductor is supported by transverse wires from poles placed on either side of the roadway.

**Straight-Line Suspension.**—Suspension by means of a straight-line trolley hanger.

**Straight-Line Trolley Hanger.**—A trolley hanger employed on a straight trolley line, suitably supported by a span wire so as to have a vertical strain only.

**Straightaway Bunched Cable.**—A bunched cable, the separate conductors of which are placed in successive layers, and extend in the direction of the length of the cable without any twisting, as distinguished from a helically wound cable.

**Strain.**—The deformation produced by the action of a stress.

**Stranded Conductor.**—A conductor formed of a number of smaller interlaced or twisted conductors, either for the purpose of reducing self-induction, or eddy currents, or for increasing its flexibility.

**Stranded Core.**—A core whose conductor is stranded, as opposed to a core whose conductor is a solid wire.

**Stranded Feeder Conductor.**—A feeder conductor formed of stranded wires.

**Stranded Line.**—A line formed of a stranded conductor.

**Stranding of Conductor.**—Forming a conductor of a number of separate conductors or strands.

**Strap Coppers.**—Copper conductors formed of bars or straps, employed in connection with a bar-armature winding.

**Strap-Driven.**—A term sometimes employed for belt-driven.

**Strap Key.**—A key made from an elastic strip or strap of metal.

**Strap Switch.**—A switch made from a strip or strap of metal.

**Straps and Climbers.**—A device employed by line-men for climbing wooden telegraph poles.

**Stratham's Electric Fuse.**—A form of fuse in which the ignition is effected by an electric spark.

**Stratification Tube.**—A vacuum tube whose residual atmosphere displays alternate dark and light strata, or stratifications, on the passage through it of an induction-coil discharge.

**Stratified.**—Arranged in separate layers or strata.

**Stratified Discharge.**—The alternate light and dark spaces assumed by the discharge of an induction coil through a partially exhausted gas.

**Stray Chain.**—In submarine cable-work, a length of chain which attaches the end of a buoyed cable to the mushroom anchor mooring chain.

**Stray Currents.**—A term sometimes used for eddy currents.



**Stray Field.**—(1) Leakage magnetic flux.

(2) That portion of a magnetic field which does not pass through an armature or other magneto-receptive device.

**Stray Flux.**—The flux of a stray field.

**Stray Power.**—That portion of the power applied to drive a machine which is lost by various frictions.

**Stream-Lines of Escaping Fluid.**—

Lines which show the actual paths of the particles of an escaping fluid.

**Streamers.**—Pillars or parallel flashing columns of light frequently seen during the prevalence of an aurora.

**Streaming Discharge.**—A form assumed by a flaming discharge between the secondary terminals of an induction coil, when the frequencies of the alternations increase beyond a certain limit, and the potential is consequently increased.

**Streamings.**—(1) A term sometimes employed for electrostatic or electro-magnetic flux. (2) X-ray streamings.

**Street Call-Point in Fire Telegraphy.** Any point in a street where an alarm call-box is placed.

**Street-Car Controller.**—(1) An electric switching apparatus contained in a box placed on the platform of an electric street-car, and employed to control the speed of the car. (2) A car-controller.

**Street-Car Lamp.**—An incandescent lamp provided with an anchored filament, suitable for use in a street-car.

**Street-Car Motor.**—A motor employed for the propulsion of a trolley car.

**Street-Car Recording Watt-Meter.**—A wattmeter designed for use on a street-car for registering the amount of electric energy delivered to a car in a given time.

**Street Load-Diagram.**—A diagram showing the electric load on each street of any particular district of electric supply.

**Street Mains.**—In any system of electric distribution, the conductors extending through the streets from junction box to junction box, through which the current is distributed from the feeders, and from which service wires are taken.

**Street Railway, Electric.**—(1) Any electrically propelled street-railway. (2) The ordinary trolley system of electric car propulsion.

**Street Service.**—(1) In a system of incandescent-lamp distribution that portion of the circuit which is included between a main and the service cut-out. (2) That portion of service conductors which lies outside of the building served. (3) In a

system of electric distribution including street lighting, service wires supplying street lamps.

**Strength of Current.**—(1) A general term for the magnitude of the current in a circuit. (2) Amperage.

**Strength of Magnetic Field.**—The magnetic force acting on a free unit magnetic pole placed in any magnetic field.

**Strength of Magnetism.**—A term sometimes used for intensity of magnetization.

**Stress.**—The pressure, pull or other force, producing a deformation or strain.

**Stress Flux.**—(1) A general term for the flux producing any stress. (2) The surface integral of stress passing through a surface.

**Stretching Insulator.**—An insulator of extra mechanical strength provided with means for carrying a short extra length of wire, twisted around a stem such that the excess can be employed for making a joint, or for other purposes.

**Striae, Electric.**—Parallel streaked bands, consisting of alternate light and dark spaces, produced in low-vacuum tubes by an electric discharge through them.

**Striking.**—Subjecting an article to the action of a striking bath.

**Striking an Arc.**—Separating the carbon electrodes for the formation of an arc between them.

**Striking Bath.**—A bath containing less silver and a greater proportion of free cyanide, employed in silver plating, for obtaining an almost instantaneous deposit of silver before subjecting the object to the regular plating bath.

**Striking Distance.**—A term sometimes employed for sparking distance, or the distance through which a disruptive discharge will pass.

**Striking Mechanism of Arc Lamp.**—The mechanism employed in an arc-lamp to separate the carbons on the establishment of the arc.

**Stringing Wires.**—Placing aerial wires on poles or other supports.

**Strip Commutator.**—A commutator formed of plates or flat strips as opposed to a commutator whose segments are strips placed edgewise.

**Strip Fuse.**—A name sometimes applied to a safety strip.

**Strip Resistance.**—A resistance formed of strip or strap conductors.

**Stripping.**—Dissolving the metal coating from a silver, gold or other plated article.

- Stripping Bath.**—A bath employed for removing an electro-plating of gold, silver or other metal, either by simple dipping or by electric action.
- Stripping Liquid.**—(1) The liquid employed in a stripping bath. (2) The liquid employed to remove the coating of one metal from the surface of another without affecting the other metal.
- Stroboscope.**—An instrument employed in the study of periodic motion.
- Stroboscopic.**—Of or pertaining to the stroboscope.
- Stroboscopic Disc.**—A disc employed in a stroboscope.
- Strong-Current Arrester.**—Any form of arrester suitable for protecting a line from a strong current produced by accidental contact with a trolley, power or lamp circuit.
- Struck.**—A word employed in electro-plating to characterize a surface that has been covered with a film of electrolytically deposited silver or nickel, by being placed in a bath and exposed for a few moments to the action of a strong current.
- Structural Carbon.**—A term applied to a carbon lamp-filament obtained by the carbonization of any structural carbonizable material such as bamboo.
- Structural Magnetic Flux.**—(1) Magnetic flux produced by the alignment of the individual molecular magnets in iron, steel or other magnetic substance. (2) Magnetic flux produced by means of a structural magneto-motive force. (3) Magnetic flux produced by iron or other magnetic metal as opposed to flux produced by electric currents.
- Structural Magneto-Motive Force.**—(1) A name sometimes given to an aligned or induced magneto-motive force, in order to distinguish it from the prime magneto-motive force. (2) A magneto-motive force produced by aligning or structurally arranging the molecular magneto-motive forces inherent in iron, steel, or other magnetic substance.
- Structureless Carbons.**—A term sometimes applied to carbon filaments that are obtained by the carbonization of a structureless material, such as tannine or celluloid.
- Struts for Telegraph Poles.**—Inclined wooden or iron props applied to telegraph poles in order to resist thrusts or pressures.
- Sturgeon's Wheel.**—A name sometimes applied to Barlow's wheel.
- Sub-Aqueous.**—Under water.
- Sub-Aqueous Cable.**—(1) A cable employed for use under water, generally under fresh water, as in crossing a river. (2) A river cable as distinguished from a sea cable.
- Sub-Branch.**—A term sometimes employed for a branch taken out of or tapped from a branch.
- Sub-Centre Transformer.**—A transformer placed at, and supplying secondary circuits radiating from, a sub-centre of distribution.
- Sub-Divided Conductor.**—(1) A stranded conductor. (2) A compositely formed conductor. (3) A multiple-wire conductor.
- Sub-Divided Transformer.**—(1) A transformer having subdivisions in its primary or secondary coils. (2) A transformer having a sub-divided magnetic circuit.
- Sub-Exchange for Telephones.**—A local exchange in connection with a central exchange.
- Sub-Mains.**—(1) Conductors which branch off from the mains. (2) Mains which are themselves branches of mains.
- Sub-Marine.**—Under the sea.
- Sub-Marine Boat, Electric.**—A boat capable of being propelled and steered while under water.
- Sub-Marine Board.**—(1) A complete set of sub-marine cable telegraphic instruments mounted on a board. (2) A sub-marine cable testing board.
- Sub-Marine Cable.**—A cable designed for use under water, generally under the ocean.
- Sub-Marine Finder.**—A form of induction balance proposed for the location of torpedoes, anchors, iron ships or other metallic submerged articles.
- Sub-Marine Fuse.**—A fuse employed for the ignition of a sub-marine mine.
- Sub-Marine Key.**—A key suitable for use in sub-marine telegraphy.
- Sub-Marine Mine.**—A mass of gun-cotton or other explosive material contained in a water-tight vessel and placed under water so as to explode on the passage of an enemy's vessel over it.
- Sub-Marine Search Light.**—An incandescent light employed for sub-marine exploration.
- Sub-Marine Sentry.**—A device sometimes employed in sub-marine cable work for indicating the presence of very shallow water, and consisting of a water kite which is below the vessel and which rises to the surface when it strikes the sea-bottom.

**Sub-Marine Telegraph.**—A general term for the apparatus employed in sub-marine telegraphy.

**Sub-Marine Telegraphy.**—(1) A system of telegraphy in which the line wire consists of a sub-marine cable. (2) A system of telegraphy across oceans.

**Sub-Marine Telephony.**—Telephony carried on by means of sub-marine cables.

**Sub-Permanent Magnetism.**—A term sometimes employed for the character of the magnetism in an iron ship, as distinguished from that of a magnetized steel bar, and as indicating that the permanence in the magnetism of the former is not as marked as in that of the latter.

**Subscriber's Indicator.**—In a telephone switchboard, the indicator or drop connected in a subscriber's circuit and operated by his call.

**Subsidiary Distributing Board.**—A distributing board auxiliary to a multiple telephone switchboard, and from which the subscribers' lines are portioned to the local spring jacks for the various operators, in order to equally distribute their work.

**Sub-Station.**—An auxiliary station.

**Sub-Station Accumulator.**—An accumulator employed at substations, or auxiliary centres of distribution.

**Sub-Station Transformer.**—A transformer employed at an auxiliary station or sub-station.

**Substitute Primary Coil.**—(1) A secondary-primary coil. (2) An intermediate coil in a transformer which alternately takes the part of a secondary and primary.

**Substitution Method.**—A method of measuring resistances, currents, electromotive forces, etc., by removing them from a circuit and replacing them by a known or adjustable corresponding resistance, current or electromotive force.

**Subterranean.**—Under the earth.

**Subterranean Mine.**—An underground mass of gunpowder, or gun-cotton or other high explosive, placed in suitable vessels for protection against moisture, provided with an electrically connected fuse, which is either exploded automatically on the movement of an enemy over it, or by a distant operator.

**Sub-Transformer Station.**—In a system of electric distribution by alternating currents, an auxiliary station at which transformers are placed for local secondary distribution.

**Sub-Trunk Telephone Line.**—(1) An

auxiliary trunk telephone line. (2) A trunk line connecting telephone exchanges and used for making connections with trunk lines.

**Suburban Communication.**—Telephonic or telegraphic communication between the suburbs and central portions of a city.

**Suburban Electric Railway.**—An electric railway connecting the centre of a city with the suburbs.

**Subway, Electric.**—An accessible underground way or passage provided for the reception of electric-light wires or cables.

**Successive-Contact Key.**—Any form of key employed to make two or more successive contacts.

**Sugg.**—A name sometimes given to a standard British candle.

**Sulphating.**—A name applied to one of the sources of loss in the operation of a storage cell, by means of the formation of an inert coating of lead sulphate on the surface of the battery plates.

**Summer Lightning.**—A name sometimes given to heat lightning.

**Sunflower Commutator.**—(1) A commutator resembling a sunflower in appearance. (2) A form of flat or disc commutator.

**Sun-Light Color-Values.**—Such luminous frequencies in a source of artificial light as will give to its light the same effects as are produced by sunlight.

**Sunshine.**—The luminous radiant energy emitted by the sun.

**Sun-Spot Disturbance.**—Any disturbance due to, attributed to, or accompanying, the presence of spots on the sun.

**Sun-Spots.**—Dark spaces, varying in number and position, which appear on the surface of the sun.

**Sun-Stroke, Electric.**—(1) Electric prostration produced by exposure to the light of an electric arc. (2) Physiological effects similar to those produced by exposure to the sun, experienced by those exposed for a long time to the intense light and heat of the voltaic arc.

**Sun Telegraph.**—A name sometimes applied to the heliograph.

**Sunk Winding.**—(1) A name sometimes employed for an iron-clad winding. (2) A winding sunk below the surface of an armature or other device.

**Superficial Eddy-Currents.**—Eddy currents produced in conducting substances that are limited to the outer layers thereof.



**Superficial Field.**—A field produced by the super-position of two or more separate fields.

**Superposed Magnetism.**—A term applied to a magnetism impressed on an already magnetized substance.

**Super-Saturation.**—A condition of a solution which has been allowed to cool, while out of contact with air, below its point of crystallization or solidification.

**Super-Saturation of Solution.**—The condition assumed by a warmed saturated solution of a salt when placed in a closed vessel out of contact with the air, and allowed to cool, without being shaken.

**Supervising Operators.**—In telephony, or telegraphy, operators whose duty it is to supervise the work of other operators.

**Supplement of Angle.**—What an angle needs to bring its value to  $180^\circ$ .

**Supplementary Dynamo.**—A word sometimes used for a booster dynamo.

**Supply Conductors.**—(1) A term sometimes applied to the sub-mains in a system of incandescent light distribution. (2) Conductors which convey electric energy.

**Supply Mains.**—A term sometimes applied to the mains in a system of incandescent light or power distribution.

**Supply Meter, Electric.**—A meter which indicates or measures the electricity or electric energy supplied to a given customer or machine.

**Supply Unit.**—A name proposed for the Board of Trade unit.

**Support Plate of Storage Cell.**—A term sometimes employed for the grid of a storage cell.

**Surface Action.**—Any action limited to a surface.

**Surface Contact of Street-Railway Car.**—A contact, flush with the surface of a street, and intended for use in connection with the electric propulsion of a street-railway car.

**Surface Contact-Resistance between Metal and Liquid.**—The resistance introduced into a primary or secondary cell at the contact between the metal and liquid.

**Surface Contact Street Railway System.**—A system of street-railway propulsion employing surface contacts.

**Surface Density.**—The quantity of electricity per-unit-of-area at any point on a charged surface.

**Surface-Efficiency of Filament.**—(1) The efficiency of a particular character of surface for luminous radiation. (2) The

luminous efficiency of a particular character of surface in a filament.

**Surface Integral.**—(1) The sum of all the products of a point function and its associated element of area, lying on a surface, when the elements are all indefinitely small. (2) The integral of a quantity taken over a surface.

**Surface Integral of Magnetic Induction.**—The total magnetic flux passing through a surface.

**Surface Magnetization.** In the distribution of imaginary magnetic matter, the magnetism residing on a surface, or the so-called free magnetism.

**Surface-Wound Armature.**—(1) An armature wound on its surface, as distinguished from an iron-core armature. (2) An armature in which the conductors lie over the surface of the core, instead of being placed in grooves or slots formed therein.

**Surfusion.**—A word sometimes employed for super-saturation.

**Surgical Lamp.**—A lamp employed in surgical exploration, examination, or operation.

**Surging Circuit.**—Any circuit through which a surging discharge is passing.

**Surging Discharge.**—(1) A discharge accompanied by electric surgings. (2) An oscillatory discharge.

**Surgings, Electric.**—(1) Electric oscillations set up in a conductor that is undergoing rapid discharging, or in neighboring conductors that are being rapidly charged and discharged. (2) Electric oscillations, direct or induced.

**Susceptance.**—In an alternating-current circuit, branch, or conductor, the quantity whose square added to the square of the conductance is equal to the square of the admittance.

**Susceptibility.**—A word sometimes used for magnetic susceptibility.

**Suspended Cable-Way.**—A modification of the telpherage system, in which a carriage provided with one or more grooved wheels is electrically driven over a suspended cable.

**Suspended-Coil Galvanometer.**—Any form of galvanometer in which the current passing is measured by the movements of a suspended coil.

**Suspended Trolley-Way.**—(1) A suspended cable-way. (2) A form of telpherage system.

**Suspender.**—A word sometimes used for a cable suspender.



**Suspender for Telephone Cable.**—(1)

A word sometimes employed for cable hanger. (2) A hook or support for a telephone cable.

**Suspending Hook for Telephone Cable.**—A cable hanger.**Suspending Wire of Aerial Cable.**—(1)

The wire from which an aerial cable is strung or suspended. (2) A messenger wire.

**Suspension.**—(1) The mechanism for suspending a thing, with or without the thing suspended. (2) The means employed in suspending any system, such as a needle, a pendulum, or a car motor.**Suspension for Car-Motor.**—The means employed for supporting a car-motor on a car truck.**Sustained Currents, Electromotive Forces or Fluxes.**—Any electromotive force, current or flux, whose effect is continued, as distinguished from one whose effect is temporary.**Swage.**—A particular form of anvil on which highly heated metallic plates are shaped by hammering them into forms the same as that of the anvil on which they are placed.**Swage.**—To fashion heated metallic plates by hammering them into the form of the anvil on which they are supported.**Swaging.**—Fashioning highly heated metallic plates into any desired form by hammering, while on suitable dies.**Swaging, Electric.**—Forming or shaping of metallic plates by hammering them against suitable anvils or dies while softened by electric heat.**Sweating.**—A term employed for the process of soldering together the ends of electric-light cables.**Swelling Current.**—In electro-therapeutics, a current that begins weak and is then periodically made stronger and weaker.**Swelling Radio-Currents.**—A term employed in electro-therapeutics for Faradic currents that are caused to gradually increase in strength and then to gradually decrease to zero strength.**Sweep.**—(1) In submarine cable work, a drag. (2) In submarine cable work, a haul made with a grapnel across a line of cable.**Sweeper, Electric.**—A term employed for an electrically-driven sweeper.**Sweeping-Out Charge.**—A phrase employed in double-current signalling for freeing the line from a charge produced in

sending one signal, by reversing the direction of the current through the line before sending the next signal.

**Swinging Annunciator.**—A pendulum annunciator.**Swinging Cross.**—A term sometimes given to an intermittent cross.**Swinging Earth.**—A name sometimes given to an intermittent earth.**Swinging Voltmeter.**—A voltmeter mounted upon a swinging bracket of a switchboard, so as to be capable of being read from any direction.**Swiss Commutator Switchboard.**—A switchboard having cross-bars after the type of a Swiss commutator.**Switch.**—(1) Any device for readily opening or closing an electric circuit. (2) In telephony, a name sometimes given to a switchboard.**Switch-Bell.**—(1) A bell switch. (2) A combination of a bell and switch.**Switch Blade.**—A conducting strip or knifeblade of a switch.**Switch-Board.**—(1) A board, base, slab or frame of insulating material, upon which are supported conducting bars, pieces, frames or masses, with or without switches and instruments, for the ready establishment of electrical connections between circuits connected therewith. (2) A board carrying switches and instruments for controlling a distribution system and the generators connected therewith. (3) A board provided with a switch or switches by means of which electric circuits connected therewith may be opened, closed or interchanged. (4) In a central station for telegraphy, telephony, light or power distribution, the electric controlling mechanism.**Switch Cord.**—An insulated conducting cord connected with a switch.**Switch-Board Arrester.**—A device intended for use on switchboards, consisting either of some form of lightning arrester or of a sneak-current arrester.**Switch-Board Bolt.**—A bolt for mechanically fastening apparatus to a switchboard or the panels of a switchboard to a frame.**Switch-Board Bracket.**—A bracket on a switchboard for supporting an incandescent lamp or other device.**Switch-Board Cable.**—Any cable connected with a switchboard.**Switchboard Fittings.**—A general term embracing the connectors, set screws, wire-holders or bus-bar connections, em-

played in placing the different apparatus on a switchboard.

**Switch-Board Protector.**—(1) A protector provided with a suitable electromagnetic safety device, or with a fuse wire or safety catch, placed at cable heads, at the junction between aerial-land and underground lines, for the purpose of protecting the cable from a too powerful electric discharge or current. (2) Any lightning, or circuit protector, placed on a switchboard.

**Switchboard Transformers.**—Transformers on an alternating-current switchboard for locally supplying alternating currents of reduced pressure.

**Switch-Board Wattmeter.**—A wattmeter placed on a switchboard to determine the out-put, or the intake, of some circuit connected therewith.

**Switch-Box.**—Any box containing one or more switches.

**Switch-Finger.**—A contact-finger, or projecting metallic contact on the cylinder of a street-car controlling-switch, or on similar apparatus.

**Switch-Handle, Electric.**—In electric railway block-signalling, a miniature railway electric switch handle for closing and opening an electric circuit.

**Switch Hole.**—A hole provided in a switch key for the insertion of a plug.

**Switch Hook.**—(1) An automatic telephone hook. (2) A hook which serves the purpose of a switch.

**Switch Jack.**—A spring jack.

**Switch Pin.**—A metallic pin or plug provided for insertion in a switchboard.

**Switch Room.**—The room or hall in a central telephone exchange in which a switchboard is placed.

**Switch Spring.**—A spring placed in a switch for its mechanical operation, or for securing electric connection.

**Switched-In.**—Thrown into a circuit by means of a switch.

**Switched-Out.**—Removed from a circuit by means of a switch.

**Swivel Clevis.**—A device consisting essentially of a nut and bolt, by means of which any slack in a guy-rod may be taken up.

**Symmetrical Alternating Current.**—Any alternating current whose successive semi-periods, waves, or alternations possess opposite but equal values, or correspond in all respects save in direction.

**Symmetrical Alternating Electromotive Forces.**—Electromotive forces

whose successive semi-waves or alternations possess equal but opposite values, or correspond in all respects save in direction.

**Symmetrical Induction of Armature.**

—(1) An induction produced by the simultaneous passage of the same quantity of magnetic flux through adjoining halves of the armature. (2) A symmetrical magnetization in an armature.

**Symmetrical Magnetic Field.**—A field whose magnetic flux is symmetrically distributed.

**Symmetrical Polyphase System.**—

A polyphase system symmetrically arranged in regard to conductors, pressures, currents and loads.

**Sympathetic Electric Vibrations.**—

(1) Electric vibrations produced in a circuit by the electro-magnetic waves given off by a neighboring circuit. (2) Electric vibrations that are produced by resonance.

**Sympathetic Generator.**—An induction generator.

**Sympathetic Vibrations.**—Vibrations

set up in bodies, and having the same frequency as that produced by the exciting body.

**Symphonance.**—A word proposed in place of resonance.

**Synchronism.**—(1) Unison of frequencies

in alternating-current systems or apparatus. (2) The simultaneous occurrence of any two events. (3) Generally, the co-periodicity and co-phase of two periodically recurring events. (4) The coincidence in cyclic recurrence of two or more periodic variables, without regard to amplitude.

**Synchronizable.**—Capable of being synchronized.

**Synchronize.**—(1) To cause to occur or

act simultaneously. (2) To bring two alternating-current machines into unison or co-periodicity, and into practical coincidence of phase, so that they may be connected together.

**Synchronized.**—Caused to occur or act simultaneously.

**Synchronizer.**—(1) Anything causing or

tending to cause synchronism. (2) A phase indicator. (3) A device for indicating when synchronism is attained between alternators that are to be connected in parallel.

**Synchronizing Dynamo-Electric Ma-**

chines.—Adjusting the frequencies and phases of two alternating-current dyna-

mos so as to permit of their being coupled or joined in parallel.

**Synchronizing Torque.**—The torque of an alternating-current generator or motor armature tending to bring it into synchronism with some other armature operated with it.

**Synchrograph.**—A name given to a record obtained by a polarizing photo-electric apparatus.

**Synchronous.**—(1) Occurring simultaneously in point of time. (2) Generally, co-periodic and co-phased, as distinguished from isochronous, which connotes agreement in period only.

**Synchronous Generator.**—A generator of alternating currents, operating or capable of operating in synchronism with another generator.

**Synchronous Motor.**—A form of alternating-current motor which requires to be brought into step with the driving current before it will properly operate.

**Synchronous Multiphase Motor.**—A multiphase motor designed to operate in isochronism with the generator or generators connected with it.

**Synchronous Multiplex Telegraphy.**—A general term for the apparatus employed in synchronous multiplex telegraphy.

**Synchronous Multiplex Telegraphy.**—

A system of simultaneous telegraphic transmission in which a number of messages, either all in the same direction, or part in one and the remainder in the opposite direction, can be simultaneously transmitted over a single line wire.

**Synchronous Reactance.**—(1) The apparent reactance of a synchronous motor armature under working conditions. (2) The combined apparent reactance of self-induction and armature reactance of a synchronous motor armature under working conditions.

**Synchronous Speed.**—The speed of a motor or generator at which it is in synchronism with the current in the system to which it is connected.

**Synchronous Vibrations.**—Vibrations produced by two or more separate systems that exactly coincide, both in frequency and in phase.

**Synthesis.**—(1) Indirect analysis or the formation of a chemical substance by the combination of its constituent parts. (2) The budding-up or combination of atoms into molecules.

**System of Electric Lighting.**—(1) A term sometimes applied to an electric light installation. (2) An electric light plant.

## T

**t.**—A symbol employed for time.

**t: m.**—An abbreviation for turns-per-minute, a practical unit of angular velocity.

**T. P. Switch.**—A contraction for triple-pole switch.

**T-Connector.**—A connector provided for connecting a wire with two branch wires, and resembling the letter T in shape.

**T-Shaped Spark.**—A variety of three-branched spark obtained by the discharge of a Leyden jar through a peculiar form of induction coil.

**Table-Key.**—A key placed on the table of a telephone exchange for effecting the connections with an operator.

**Table Push.**—A push-button connected with a table for ease in ringing a call-bell.

**Table Switch.**—A switch on the table of a telephone switchboard.

**Tablet Board.**—A switchboard divided into panels or tablets.

**Tablet Check.**—In telegraphy, a tabulated form upon which messages sent and

received are checked off for the purpose of recording the traffic and ensuring against the loss of a message.

**Tachograph.**—An apparatus for recording the number of revolutions per minute of a machine or shaft.

**Tachometer.**—(1) An apparatus for indicating at any moment on a dial the number of revolutions per minute of a shaft or machine with which it is connected. (2) A speed indicator.

**Tachyphore.**—(1) A name proposed for a system of electric transportation in which a carriage formed of magnetic material is propelled by the sucking action of solenoids placed along the tracks, and energized in succession during the passage of the car. (2) A port-electric system.

**Tail Light.**—A light displayed at the rear of a train, in order to avoid rear-end collisions.

**Tail of Mercury.**—An elongation or tail, of grayish color, due to the presence of



oxides, left behind a drop of impure mercury, when moved over smooth surface.

**Tailings.**—(1) In telegraphy, residual discharges from the line through the receiving instrument, following each signal, and thus tending to make the signals run together. (2) Residual or return charges or currents in the transmission of electromagnetic waves through a dielectric.

**Talantoscope.**—A low-vacuum tube employed in connection with a Hertzian oscillator to determine when it is sending forth waves, and when it is under the influence of unidirectional discharges and is not sending forth waves.

**Talking Circuit.**—In telephony, a circuit employed by a subscriber during conversation, as distinguished from a calling circuit.

**Tamadine.**—A modified form of tri-nitro cellulose, employed, when cut into suitable shapes and subsequently carbonized, for the filaments of incandescent lamps.

**Tangent.**—(1) One of the trigonometrical functions. (2) In a right-angled triangle formed by a radius-vector, base, and perpendicular, the ratio of the perpendicular to the base.

**Tangent and Sine Galvanometer.**—A galvanometer furnished with two magnetic needles of different lengths, the small one being used for tangent measurements, and the long one for sine measurements of current strength.

**Tangent Galvanometer.**—An instrument in which the deflecting coil consists of a coil of wire within which is placed a needle, supported at the centre of the coil, and very short by comparison with the diameter of the coil.

**Tangent Scale.** A scale designed for use with a tangent galvanometer on which the values of the tangents are directly marked, instead of degrees of the circle as ordinarily, thus avoiding the necessity of finding from tables, tangents corresponding to the degrees.

**Tangentially - Laminated Armature Core.**—An armature core consisting of a closely-coiled ribbon of sheet iron.

**Tank Heater, Electric.**—A form of electric heater for heating liquids, consisting essentially of a heating coil immersed in a liquid contained in a tank.

**Tanning, Electric.**—The application of electric currents to the tanning of leather.

**Tap.**—(1) A conductor attached as a shunt to a larger conductor. (2) A derived circuit for carrying off a share of the main current. (3) A wire taken from the

junction between the short and long sections of a quadruplex battery.

**Tap Wire in Quadruplex Telegraphy.** The intermediate wire or conductor in a system of quadruplex telegraphy, which divides the battery into two unequal parts, called respectively the long side and the short side.

**Tap Wires.**—The wires or conductors employed in trolley systems to carry the current from the feeders or mains at a pole to a near point on the trolley wire.

**Taped Conductor.**—A taped wire.

**Taped Wire.**—(1) A conducting wire covered with an insulating material in the shape of a tape. (2) A wire covered with an insulating material and subsequently taped.

**Tapered Mains.**—Mains in the tree system whose diameters diminish in successive sections.

**Taping.**—(1) Covering a wire or a joint with an insulating tape. (2) A covering of tape applied to a cable sheathing.

**Tapers.**—Wires tapering in diameter for the purpose of effecting a splice between two different types of submarine cables.

**Tapper Bell.**—A single-stroke electric bell provided with a suitable key for signalling purposes.

**Tapper Key.**—A term sometimes employed in place of a Morse tapper.

**Tapper Signal.**—In a system of mining signals, signals sent or received by means of tapper bells.

**Tapping a Circuit.**—Introducing a loop or branch in a telegraphic or telephone circuit, for the purpose of intercepting the messages sent over the circuit.

**Taps.**—A general term employed, in a system of incandescent lamp distribution, for branches or sub-branches that are carried from the mains into the rooms of a building or to the fixtures in the halls.

**Target, Electric.**—A target in which the point struck by the ball is automatically registered by means of electric devices.

**Tasimeter.**—An apparatus designed by Edison for the purpose of detecting minute heat changes by variations in the resistance of a soft-carbon disc, resulting from changes of pressure due to the expansion of a substance exposed to the heat to be measured.

**Teaser.**—An electric current teaser.

**Teaser, Electric.**—(1) A coil of fine wire placed on the field magnets of a dynamo in a shunt across the main circuit, in addition to the field magnet series



coil. (2) A series coil placed on a field magnet, in addition to a regular shunt field, for the purpose of preliminary excitation.

**Teaser Winding.**—An additional coil wound on the armature of a monocyelic generator of smaller cross-section and fewer turns than the main winding, one end of which is connected at the centre of the main winding, and the other to a collecting ring.

**Tee Box for Underground Cables or Conductors.**—A box, shaped like a letter T, and containing a joint or joints between a main line and an offset, branch, lateral, or service conductor.

**Tee Connector.**—A T-shaped connector employed for readily connecting a wire at right angles to another wire.

**Teeth of Armature.**—Polar projections or ridges on the surface of an armature-core, between which lie the armature windings or conductors.

**Tele-Anemograph.**—A device for recording the indications of an anemograph at a distance.

**Tel-Autogram.**—A recorded message obtained by means of a tel-autograph.

**Tel-Autograph.**—A telegraphic system for the fac simile reproduction of writing at a distance.

**Tele-Autograph.**—An orthography sometimes employed for tel-autograph.

**Telo-Barograph.**—A device for recording the indications of a barometer at a distance.

**Tele-Barometer, Electric.**—An electric recording barometer, for indicating and recording barometric pressures at a distance.

**Telegram.**—Any despatch received by means of a telegraph.

**Telegraph.**—(1) A general name for the instrument or combination of instruments employed for conveying a communication or despatch to a distance by means other than that of the unassisted voice. (2) A general term for any apparatus employed in telegraphy.

**Telegraph.**—To transmit a message by means of a telegraph.

**Telegraph Circuit.**—(1) An electric circuit employed in telegraphy. (2) An insulated line apparatus at one or more telegraph stations and a ground return circuit.

**Telegraph, Electric.**—A general term for any apparatus employed in electric telegraphy.

**Telegraph Line-Adjuster.**—A general term given to apparatus by means of which the adjustment of a telegraph line is facilitated.

**Telegraph Loop.**—A pair of wires extending from a telegraphic station to a branch office.

**Telegraph Posts.**—A term sometimes employed for telegraph poles.

**Telegrapher.**—A telegraphic operator.

**Telegrapher's Cramp.**—An affection of the hand of a telegrapher, due to continuous excessive use of the same muscles, somewhat similar to the disease known as writer's cramp.

**Telegraphic.**—Of or pertaining to a telegraph.

**Telegraphic Alarm.**—An alarm bell for calling the attention of an operator to a telegraphic instrument when the latter is of the non-acoustic or needle type.

**Telegraphic Alphabet.**—The code employed for letters and other characters in telegraphy.

**Telegraphic Arm.**—A cross-arm placed on a telegraphic pole for the support of the insulators.

**Telegraphic Box-Sounder.**—A sounder whose receiving magnets are enclosed in a hollow box, for the purpose of increasing the intensity of the sound by resonance.

**Telegraphic Bracket.**—A support or cross-piece placed on a telegraph pole, tree, wall or roof, for the support of a telegraphic line-insulator.

**Telegraphic Cable.**—A cable designed to establish telegraphic communication between different points.

**Telegraphic Clock.**—A name sometimes applied to a master clock.

**Telegraphic Code.**—The pre-arranged system of signals employed in any system of telegraphy.

**Telegraphic Cross-Arm.**—A term sometimes employed for telegraphic arm.

**Telegraphic Dial.**—A dial board containing letters of the alphabet and figures, employed in dial telegraphy.

**Telegraphic Dynamo.**—A dynamo employed for generating the currents used in telegraphic transmission.

**Telegraphic Earth-Circuit.**—That portion of a telegraphic circuit which is completed through the earth or ground.

**Telegraphic Embosser.**—An apparatus for recording a telegraphic message on a paper strip in raised or embossed characters.

**Telegraphic Fixtures.**—A term generally limited to the various supports provided for the attachment of telegraphic wires.

**Telegraphic Ground-Circuit.**—An earth circuit used in any system of telegraphy.

**Telegraphic House-Top Fixtures.**—Telegraphic fixtures placed on the roofs of buildings for the support of the lines.

**Telegraphic Ink-Writer.**—(1) A device employed for recording the dots and dashes of a telegraphic message in ink on a strip of paper. (2) A Morse inker.

**Telegraphic Insulator.**—An insulator employed on telegraphic lines.

**Telegraphic Interrupter.**—(1) A device for making and breaking a circuit at a definite rate. (2) A telegraphic key, or other analogous device.

**Telegraphic Interruption.**—(1) Any fault in a line or apparatus which prevents telegraphic transmission. (2) A term sometimes employed in telegraphy for faults in general. (3) A break or total stoppage of signals in a submarine cable.

**Telegraphic Joint.**—A permanent contact or junction between the ends of two electric conductors.

**Telegraphic Key.**—The key employed for sending over the line the successive makes-and-breaks corresponding to the dots and dashes of the Morse alphabet, or to the deflections of the needle in a needle telegraph.

**Telegraphic Line.**—A conducting circuit employed in any telegraphic system for the transmission of electric impulses or currents.

**Telegraphic Line-Circuit.**—The conductor or line connecting different telegraphic stations.

**Telegraphic Needle.**—A needle employed in telegraphy to represent by its movements to the right or left, respectively, the dots and dashes of the Morse alphabet.

**Telegraphic Paper-Winder.**—An apparatus for winding or coiling the paper fillet used on a telegraphic register.

**Telegraphic Photography.**—A term sometimes used for means whereby an image of a photographic object may be telegraphically transmitted to a distant station.

**Telegraphic Pocket-Relay.**—A form of telegraphic relay of such small dimensions as to permit it to be readily carried in the pocket.

**Telegraphic Polar-Relay.**—A telegraphic relay provided with a polarized armature.

**Telegraphic Pole.**—A wooden or iron pole provided with suitable insulators for the support of an overhead telegraphic line or lines.

**Telegraphic Register.**—(1) An apparatus employed at the receiving end of a telegraphic line for the purpose of obtaining a permanent record of the telegraphic despatch. (2) A Morse register.

**Telegraphic Registering Apparatus.**—(1) A name sometimes given to a telegraphic recorder. (2) A Morse register.

**Telegraphic Repeater.**—(1) Any telegraphic device whereby the relay, sounder or registering apparatus is caused to repeat into another circuit the signals received. (2) An apparatus for maintaining telegraphic communication between two circuits not in conductive connection.

**Telegraphic Saddle.**—A bracket of special shape, placed astride, on the top of a telegraph pole, for the support of an insulator.

**Telegraphic Splice.**—A sheath connection made between two cable ends, and overlying a joint.

**Telegraphic Stay-Rods.**—Guy rods supporting telegraph poles.

**Telegraphic Stock-Printer.**—A form of printing telegraph employed for printing on a strip of paper the quotations of stocks, received from a stock exchange.

**Telegraphic Switchboard.**—(1) A device employed at a telegraphic station, by means of which any one of a number of telegraphic instruments in use at that station may be placed in or removed from any line connected with the station, or by means of which one wire may be connected to another. (2) A switchboard for conveniently effecting and changing telegraphic connections.

**Telegraphic Through-Traffic.**—A general term for the telegraphic messages sent directly between the terminal stations, as distinguished from way traffic, which includes some intermediate station.

**Telegraphic Time-Service.**—(1) Any telegraphic distribution of time. (2) The telegraphic distribution of time to jewelers, railroad time-keepers, or others in need of frequent information as to the precise time, in which electric signals are sent out from a standard clock, through relays, at two second intervals, with special signals at minute, five-minute, and hour intervals.

**Telegraphic Transmitter.**—A tablet having suitable contact marks placed on its surface, such that by moving a metallic rod over it proper signals are sent.

**Telegraphic Translator.**—A term sometimes applied to a telegraphic repeater.

**Telegraphic Way-Traffic.**—Telegraphic messages sent from one office to another, as distinguished from messages between terminal offices only.

**Telegraphic Wire.**—The wires employed in telegraphic line circuits.

**Telegraphical.**—Of or pertaining to the telegraph.

**Telegraphically.**—In a telegraphic manner.

**Telegraphing.**—Sending a communication by means of a telegraph.

**Telegraphist.**—A telegraphic operator.

**Telegraphophone.**—An instrument whereby the indentations on the cylinder of a graphophone can be reproduced upon another cylinder, at the same time that the vocal sounds represented by the indentations are being rendered audible.

**Telegraphy.**—Any system by means of which a communication or despatch is transmitted to a distance, by means other than that of the unassisted voice.

**Tele-Hydro-Barometer.**—An instrument for indicating and recording at a distance the height of water or other liquid in a vessel or reservoir.

**Tele-Hydro-Barometer, Electric.**—An apparatus for electrically transmitting to, and recording at a distant station, the height of water or other liquid.

**Tele-Indicator.**—A term sometimes employed for telemeter.

**Tele-Intensity of Projector.**—The apparent luminous intensity of a search light at a distance.

**Tele-Manometer, Electric.**—A gauge for electrically indicating and recording pressures at a distance.

**Tele-Meteorograph.**—A form of meteorograph, registering at a distance by the aid of electricity.

**Telemeter.**—An apparatus for electrically indicating and recording at a distance the pressure on a gauge, the reading of a thermometer, or the indications of a similar instrument.

**Tele-Metric.**—Of or pertaining to a telemeter.

**Telephone.**—To communicate by means of a telephone.

**Telephone.**—An instrument for the electric transmission of articulate speech.

**Telephone Battery.**—Any form of open-circuit battery, suitable for use in connection with a telephone.

**Telephone Booth.**—A telephone cabinet booth.

**Telephone Cabinet-Booth.**—A silence telephone cabinet.

**Telephone Cable.**—(1) A cable, either aerial or subterranean, suitable for the transmission of telephonic despatches. (2) Generally, a cable whose conductors are twisted in pairs, for the purpose of avoiding the disturbance produced by cross-talk.

**Telephone Call-Bell.**—A bell employed in connection with a telephone circuit for calling a correspondent at the other end of the line to his telephone.

**Telephone Call-Wire.**—(1) A wire employed in certain telephone systems, by the subscriber, for the purpose of calling the central office. (2) A special calling wire in a telephone system.

**Telephone Circuit.**—An electric circuit for the transmission of telephonic messages.

**Telephone Cords.**—(1) Flexible conductors provided for use in connection with a telephone. (2) Flexible conducting cords provided with a telephone switchboard for making connections between subscribers.

**Telephone Cross-Talk.**—A disturbance produced in a telephone circuit by induction or leakage from a neighboring circuit.

**Telephone Drop.**—An annunciator drop used on a telephone switchboard.

**Telephone Exchange.**—A central office provided with circuits, switches and other devices, by means of which any one of a number of subscribers, connected either directly or indirectly with the exchange, may be placed in communication with any other subscriber, or with some other exchange.

**Telephone-Exchange Switchboard.**—A switchboard employed in a central telephone exchange for the purpose of readily placing any subscriber in connection with any other subscriber connected with that system.

**Telephone Galvanometer.**—A high-resistance galvanometer consisting of an electro-magnet, provided with a soft-iron disc deflexibly mounted between its poles, and permanently bridged across a telephone circuit for the purpose of giving a visual call-signal.



**Telephone Head-Gear.**—Any apparatus placed on the head for readily attaching a telephone receiver to the ear of the operator.

**Telephone Indicator.**—(1) An indicator employed on a telephone circuit to indicate the number of the correspondent calling. (2) A telephone drop annunciator.

**Telephone Indicator-Coil.**—A coil employed on a telephone indicator.

**Telephone Meter.**—(1) An apparatus employed on telephone circuits for registering the number of connections between subscribers and the time or duration of the same. (2) A calculigraph.

**Telephone Relay.**—An electro-magnetic relay employed to close an indicator circuit or a call-bell circuit in a telephone system.

**Telephone Repeating-Coil.**—(1) A form of induction coil employed for repeating a telephonic message. (2) An induction coil having two insulated windings, one in each of the two telephone circuits to be connected.

**Telephone Set.**—A general term for the apparatus employed by a telephone subscriber at his office.

**Telephone Side Tone.**—The tone obtained in a telephone receiver by talking to or tapping at its own transmitter.

**Telephone Subscriber.**—A term applied to a person who is connected with a central telephone station.

**Telephone Subway.**—A subway provided for the reception of telephone cables or wires.

**Telephone Switch.**—(1) Any switch employed in connection with a telephone. (2) A switch employed to place either a call-bell or a telephone in a telephone circuit.

**Telephone Test-Board.**—A board provided in a central-telephone exchange for the leading-in and orderly arrangement of the line wires, between the outside line and the switchboard, for identification and testing.

**Telephone Time-Check.**—A clock in a telephone exchange by means of which a drop shutter is automatically released, at a particular trunk wire indicator, at the expiration of the allotted time that a subscriber is given the use of the trunk line, and by which the central-station operator's attention is called to the fact of such expiration. (2) A telephone meter.

**Telephone Tinnitus.**—(1) A professional

neurosis of the auditory mechanism ascribed to the constant use of the telephone. (2) A nervous auditory disorder attributed to constant use of the telephone.

**Telephone Transformer.**—(1) An apparatus for repeating into one circuit a telephonic message received on another circuit. (2) A telephone repeating coil.

**Telephone Translator.**—A telephone repeater.

**Telephoner.**—(1) A term sometimes applied to a person at one end of a simple telephone line, in contradistinction to a telephone subscriber at the end of a circuit connected with any telephone exchange. (2) Any one carrying on a conversation by means of a telephone.

**Telephonic.**—Of or pertaining to a telephone.

**Telephonic Alarm.**—(1) An alarm bell for calling a correspondent to his telephone. (2) A call bell.

**Telephonic Cable.**—A telephone cable.

**Telephonic Cross-Connection.**—Telephonic transposition.

**Telephonic Exchange.**—A telephone exchange.

**Telephonic Insulator.**—Any insulator employed in connection with a telephone line.

**Telephonic Line.**—The line wire or circuit employed in telephonic transmission.

**Telephonic Joint.**—A joint effected between the ends of two wires in a telephone circuit.

**Telephonic Meter.**—A telephone meter.

**Telephonic Receiver.**—(1) The instrument employed in receiving a telephonic message. (2) The instrument held to the ear for the purpose of receiving a telephonic message.

**Telephonically.**—By means of a telephone.

**Telephonist.**—Any one employing a telephone.

**Telephony.**—The art of transmitting articulate speech by means of a telephone.

**Telephoto.**—(1) An apparatus for the telegraphic transmission of pictures by means of the action of light on selenium. (2) The pherotype.

**Tele-Photography.**—A system of facsimile transmission by dots and dashes transmitted by means of a continuous current, whose intensity is varied by a transmitting instrument containing a selenium resistance.



**Telo-Radiophone.**—A form of radiophone arranged for the simultaneous transmission of telegraphic and telephonic messages.

**Telescope.**—An optical instrument for rendering distant objects visible by enlarging their apparent dimensions and by increasing the amount of the light emitted by them that reaches the eye.

**Telescopic.**—Of or pertaining to the telescope.

**Telescriptor.**—A name given to a particular form of printing telegraph.

**Teleseme.**—A self-registering hotel annunciator by means of which a dial operated in a room indicates the character of the service required.

**Telostereoscope.**—An optical instrument for causing distant objects to appear in relief.

**Telo-Thermograph.**—(1) A registering tele thermometer. (2) The record made by a tele-thermometer.

**Telo-Thermometer, Electric.**—An electrical recording thermometer, for indicating and recording temperature at a distance.

**Telluric Magnetic Force.**—A term sometimes employed for the earth's magnetic force.

**Telluric Mines.**—Explosive mines underground, distinguished from sub-aqueous, or sub-marine explosive mines.

**Telpher.**—A general name for the apparatus employed in systems of telpherage.

**Telpher Line.**—The electric circuit employed in a telpherage system.

**Telpher Locomotion.**—The transportation of merchandise by means of a telpher system, or telpherage.

**Telpher Locomotive.**—An electric motor by means of which telpher cars are drawn on a telpher line.

**Telpherage.**—A system for the conveyance of carriages suspended from electric conductors, driven by means of electric motors, that take the current required to energize them directly from the conductors on which they are suspended.

**Temper.**—To obtain the requisite degree of hardness and elasticity of a metal by cooling it while heated.

**Temperature.**—The thermal condition of a body considered with reference to its capability to communicate heat to other bodies.

**Temperature Alarm, Electric.**—An electric alarm automatically operated by a change of temperature.

**Temperature Coefficient.**—(1) A coefficient of variation in a quantity, per degree of change in temperature. (2) The coefficient by which a change of temperature must be multiplied in order to arrive at the change in a quantity due to the change of temperature.

**Temperature Elevation.**—(1) The excess of temperature of a heated body over the temperature of its environment. (2) The excess of temperature acquired by a conductor traversed by a current over the surrounding air.

**Temperature Gradient.**—(1) A line representing the rate-of-change of temperature in a body through which heat is flowing. (2) A space-rate-of-change in temperature. (3) A rate of change in any quantity varying with temperature.

**Temperature Regulating-Switch for Electric Car-Heater.**—A switch employed in systems of car heating, whereby the separate heaters may be connected in series, or in parallel groups, between the trolley and the track, or by means of which one or more of the heaters may be removed at will.

**Tempering.**—Obtaining a change in the hardness and elasticity of a metal by suddenly cooling it while heated.

**Tempering, Electric.**—A process for tempering metals in which heat of electric origin is employed instead of ordinary heat.

**Temporary.**—Lasting but for a while.

**Temporary Charge by Induction.**—An electric charge of a temporary character produced on a conductor by induction, as distinguished from a permanent charge so obtained.

**Temporary Currents.**—Currents that continue but for a brief interval of time.

**Temporary Electromotive Forces.**—Electromotive forces which continue but for a brief interval of time.

**Temporary Intensity of Magnetization.**—The intensity of the magnetization temporarily induced in a bar of soft iron, as distinguished from permanent magnetization induced in hard steel.

**Temporary Magnetization.**—(1) A word employed for the magnetization produced in a mass of soft iron, when brought into a magnetic field. (2) Magnetization which is temporary in character.

**Temporary Magneto-Motive Forces.**—Magneto-motive forces that continue but for a brief interval of time.

**Temporary Socket.**—A socket provided

for an incandescent lamp that is not intended to be permanently installed.

**Tenacity.**—(1) The stress required to produce a rupture in a mass of given cross section of any material. (2) The power of a material to resist rupture.

**Tension.**—(1) An elongating stress. (2) The strain produced in a substance by the action of a stress. (3) The pressure produced by a confined gas against the walls of the containing vessel, due to molecular impact.

**Tension, Electric.**—A term loosely applied to signify indifferently surface density, electromotive force, electromotive intensity, dielectric stress, or difference of potential.

**Tension-Ratchet.**—A name sometimes given to a line-dynamometer.

**Terminal Board.**—A switchboard situated on a dynamo.

**Terminal Branch Cut-Out.**—A cut-out for a branch taken from the end of a main line.

**Terminal Electromotive Force.**—The electromotive force of a dynamo taken at the terminals of the machine.

**Terminal Insulator.**—(1) An insulator at the terminus of a line. (2) A telegraph line insulator provided with two grooves for the reception of two ends which may be kept insulated from each other.

**Terminal Pole.**—(1) The last pole of a line. (2) A pole of greater dimensions and more securely anchored than the rest, erected at the end of a telegraphic, telephonic, trolley, or power line, or where aerial wires join subterranean cables, and intended to safely resist the lateral tension of the line.

**Terminal Pressure.**—The pressure at the terminals of any electric apparatus.

**Terminal Reflection.**—A term applied to the reflection of electro-magnetic waves from the end of an open-circuited conductor.

**Terminal Telegraphic Station.**—The telegraphic station at either terminus of a line.

**Terminal Voltage.**—The terminal electromotive force.

**Terminals.**—A name indifferently applied to the poles or to the electrodes of a voltaic battery.

**Terra-Cotta Conduit.**—An earthenware conduit.

**"Terra Voltaism."**—The operation of a telegraph system by a single voltaic element, consisting of a pair of dissimilar

metals buried in the earth at opposite ends of the line.

**Torolla.**—A sphere of hardened steel, or of lode-stone, magnetized so that the distribution of its magnetism shall resemble that of the earth.

**Terrestrial Electricity.**—A term proposed for atmospheric electricity.

**Terrestrial Magnetic Induction.**—The production of magnetism by the action of the earth's field.

**Terrestrial Magnetism.**—A name applied to the magnetism of the earth.

**Tesla Coil.**—A form of oil-insulated induction coil or transformer.

**Tesla Discharge.**—A variety of high-frequency, high pressure discharge.

**Tesla Frequencies.**—A term sometimes applied to frequencies which are much higher than those ordinarily employed.

**Tesla Transformer.**—A step-up, oil-insulated transformer, employed by Tesla in obtaining high-frequency discharges.

**Test Board.**—(1) A board employed in a telegraphic, telephonic, or transmission circuit, generally, provided with the measuring instruments required for testing its insulation and other electrical properties. (2) A board in a telephone station to which telephone lines are connected, for the purpose of quickly connecting the testing instruments to such lines.

**Test Cell.**—A voltaic cell employed for the busy or engaged test in a multiple telephone switchboard.

**Test Circuit.**—In a multiple-telephone switchboard the circuit for the busy test.

**Test Clerk.**—A clerk to whom the duties of testing the telephone lines are assigned.

**Test Loop.**—A loop running to a test board.

**Test Plugs.**—(1) Plugs used in testing. (2) Plugs for insertion in testing jacks.

**Test Ring.**—(1) A call made by the central station to each subscriber to ascertain whether the line is in good operating condition. (2) A ring in front of each jack in a multiple telephone switchboard, and supplying a contact for the busy test.

**Test Room.**—A testing room.

**Test Thimble.**—A thimble at a central telephone exchange carrying a contact, and employed for making a busy test at a multiple telephone switchboard.

**Test Wire for Multiple Switchboard.**—A wire running to a multiple switchboard and connecting all the jacks of the same number in the different sections for the

purpose of enabling the operator to ascertain whether the subscriber needed is busy.

**Test Wire of Metallic Circuit.**—(1) The return-wire of a metallic circuit. (2) In telephony, that wire in a subscriber's metallic-circuit loop which serves for the busy test at the switchboard.

**Test Wires.**—(1) The wires in a multiple telephone switchboard, by which the busy test is made. (2) Any wires or circuits used in making a test. (3) Wires to be tested or undergoing a test.

**Testing.**—(1) Submitting to trial for electric capabilities. (2) Determining the value of the current strength, the difference of potential, the resistance, the coulombs, the farads the joules, the watts, etc., in any circuit. (3) Making electrical measurements, generally.

**Testing Bank.**—A bank of lamps, or other inductionless resistances, employed in testing a circuit.

**Testing Board.**—A board employed in a telephone switchboard for the purpose of testing the condition of the lines.

**Testing Car for Railway Circuits.**—An electric trolley-car provided for making electric tests along a line of street railway while the car is in motion.

**Testing Jacks.**—In a multiple telephone switchboard, or distributing board, special jacks sometimes inserted in any circuit for testing such circuit.

**Testing Magneto.**—A magneto-electric machine employed to produce the high electromotive force required in testing high-resistance circuits.

**Testing of Joints.**—(1) Determining the insulation or conductor resistance of a joint in any circuit. (2) Ascertaining the resistance of the insulating material around a joint in a cable.

**Testing Point of Spring Jack.**—The tip of a spring jack.

**Testing Pole.**—A term sometimes employed in electro-therapeutics for the indifferent pole or electrode.

**Testing Posts.**—Hollow posts provided with a door, placed above an underground cable, into which the wires are sometimes led, employed for ease in opening and testing.

**Testing Rod.**—An insulated conducting rod employed in testing insulators for dipping into the liquid contained in their sheds, when inverted in a testing bath.

**Testing Room.**—(1) A room on board a cable-ship provided with instruments for

cable testing and signalling. (2) A room fitted with tables and apparatus for making electrical tests. (3) In a telephone exchange, a room usually near the switch room through which all telephone lines pass and arranged for conveniently testing such lines.

**Testing Switch.**—In a quadruplex telegraphic system, a switch for throwing the line from the sending battery to ground through a suitable resistance, for the purpose of enabling the distant station to obtain a balance.

**Testing Transformer.**—(1) A transformer employed in any system of distribution for the purpose of testing for grounds, for the condition of the line, for drop of potential, etc. (2) A transformer employed in testing.

**Tetanus.**—Continuous spasmodic contraction of the muscles.

**Tetrad Atom.**—An atom whose valency or atomicity is four.

**Tetrivalent.**—Possessing a valency or atomicity of four.

**Tetrode Working.**—A term applied to a four-way mode of working the Delany synchronous multiple telegraph.

**Thaumatrope.**—An optical toy depending on the persistence of the retinal image, in which two different pictures placed upon the opposite sides of a card are caused, by the rapid rotation of the card, to appear as a single picture.

**Theatre Dimmer.**—(1) A dimmer employed in theatres for varying the intensity of the illumination. (2) A rheostat or choking coil employed in a theatre-lighting circuit.

**Theatre Dimming Rheostat.**—A rheostat employed in connection with a theatre dimmer.

**Theatrophone.**—A system of telephonic communication between theatres or opera-houses and subscribers.

**Theodolite.**—An instrument employed for measuring angles in vertical or horizontal planes.

**Theoretical Magnet.**—A hypothetical magnet, assumed for the purpose of mathematical discussion as possessing infinite length and thinness, and uniform magnetization.

**Therapeutic Adaptor.**—An adaptor employed in electro-therapeutic work.

**Therapeutical Electrization.**—Subjecting different parts of the human body to the action of electric currents for the cure of a diseased condition.



**Therm.**—(1) A heat unit equal to the amount of heat required to raise the temperature of a gramme of water, at the temperature of its greatest density, one degree Centigrade. (2) The smaller calorie.

**Therm Calorie.**—A word sometimes used for the smaller calorie.

**Thermethesiometer.**—An instrument employed in electro-therapeutics for testing the temperature sense in nervous diseases.

**Thermal.**—Of or pertaining to heat.

**Thermal Absorption.**—The absorption of heat energy during its passage through a body.

**Thermal Activity.**—(1) The activity possessed by a body, arising from its heat energy. (2) The rate of doing thermal work. (3) The rate of generating heat.

**Thermal Balance.**—(1) A differential galvanometer employed for determining small differences of temperature. (2) The bolometer.

**Thermal Batteries.**—(1) Thermo-piles. (2) Thermo-electric batteries. (3) An electric source operated by heat energy.

**Thermal Caustery.**—A caustery heated by ordinary heat, as distinguished from an electric caustery, or one heated by heat of electric origin.

**Thermal Circuit Closer.**—A circuit-closer operated by changes of temperature.

**Thermal Coil of Resistance Box.**—A coil of wire inserted in a resistance box, and possessing a high temperature sufficient, for the purpose of indicating by its resistance the temperature within the box.

**Thermal Current.**—A heat current, or one due to the flow or transference of heat through a conductor.

**Thermal Current-Strength.**—The quantity of heat per second transmitted across any area of normal cross-section of a conductor.

**Thermal Diffusivity.**—A term proposed for thermometric conductivity, or the ratio of the calorimetric conductivity to the specific heat per unit volume.

**Thermal Electromotive Force of Resistance Coils.**—A thermo-electric couple inserted in a resistance box, for the purpose of determining the temperature within it.

**Thermal Equivalent of Work.**—The equivalent, in heat units, of a given quantity of mechanical work.

**Thermal Incandescence.**—The shining or glowing of a substance, generally a solid, by means of heat other than that of electric origin.

**Thermal Resistance.**—The resistance offered by a substance to the passage of heat.

**Thermal Resistivity.**—(1) Specific thermal resistance. (2) The specific thermal resistance of a substance referred to the thermal resistance of a unit cube between any pair of parallel faces.

**Thermally Effective Value.**—(1) In an alternating-current circuit, the effective values from thermal measurements or considerations. (2) The square-root-of-mean-square values.

**Thermic Balance.**—A bolometer.

**Thermic Interrupter.**—A device operated by the expansion of a metallic wire employed for the purpose of preventing more than a certain number of arc lamps being used in a circuit where the current is paid for by the number of lights, rather than by the current supplied.

**Thermo-Barometer.**—(1) A device for determining the elevation of a mountain by observing the temperature at which water boils on that elevation. (2) A hypsometer.

**Thermo-Battery.**—A term sometimes applied for a thermo-electric battery.

**Thermo-Call.**—A thermo-electric call.

**Thermo Cell.**—A thermo-electric cell.

**Thermo-Chemical Cell.**—An electric cell, in which a difference of potential is produced by the combined action of heat and chemical action.

**Thermo Chemistry.**—That branch of chemistry which treats of the measurement of chemical energy in thermal units.

**Thermochrosy.**—(1) A word expressive of the fact that ordinary radiant heat, like light, consists of an assemblage of waves of different frequencies. (2) Heat coloration.

**Thermo-Electric Battery.**—A combination, as a single thermoelectric source, of a number of separate thermo-electric cells or couples.

**Thermo-Electric Call.**—An instrument for electrically sounding an alarm when the temperature rises above or falls below a fixed point.

**Thermo-Electric Cell.**—A name applied to a thermo-electric couple.

**Thermo-Electric Couple.**—Any two dissimilar metals which, when connected at their ends only, so as to form a complete



electric circuit, will produce an electric current when one end is more highly heated than the other.

**Thermo-Electric Current.**—A current produced by a thermo-electromotive force.

**Thermo-Electric Diagram.**—A diagram in which the thermo-electric power between different metals is given for different temperatures.

**Thermo-Electric Effect.**—The production of an electromotive force at a thermo-electric junction by reason of the difference of temperature between that junction and the other junction of the couple.

**Thermo-Electric Electromotive Force of Voltaic Cell.** The thermo-electromotive force produced by a voltaic couple.

**Thermo-Electric Element.**—A name applied to either of the metals that form a thermo-electric couple.

**Thermo Electric Force.**—(1) The force produced by a thermo-electric couple. (2) The electromotive force of a thermo-electric circuit.

**Thermo-Electric Generator.**—A thermo-electric pile.

**Thermo-Electric Inversion.**—An inversion of the thermo-electromotive force of a couple at certain temperatures.

**Thermo-Electric Junction.**—A junction of a thermo-electric couple.

**Thermo-Electric Neutral Point.**—A temperature at which two thermo-electric forces are equal. (2) A temperature at which a junction of two metals has no thermal E. M. F.

**Thermo-Electric Pair.**—A thermo-electric couple.

**Thermo-Electric Pile.**—A thermo-electric battery.

**Thermo-Electric Potential-Difference.** Difference of potential produced by a thermo-electric cell or pile.

**Thermo-Electric Power.**—A number which, when multiplied by the difference of temperatures of a thermo-electric couple, will give the difference of potential generated thereby.

**Thermo-Electric Series.**—A list of metals, so arranged as to their thermo-electric powers, that each in the series is electro-positive to any lower in the list.

**Thermo-Electricity.**—(1) The electromotive forces developed by a thermo-electric cell or battery. (2) Electricity produced by differences of temperature at the junction of dissimilar metals.

**Thermo-Electrification.**—Electrifica-

tion produced by differences of temperature in a thermo-electric couple.

**Thermo-Electrometer.**—A name sometimes, though not happily, given to an electric thermometer.

**Thermo-Electromotive Force.**—An electromotive force or difference of potential produced by differences of temperature at a thermo-electric junction.

**Thermo-Element.**—A name sometimes employed for a thermo-couple.

**Thermo-Galvanometer.**—A galvanometer employed in connection with a thermopile for the purpose of showing difference of temperature by means of the currents developed.

**Thermo-Luminescence.**—Luminescence produced in a substance by heat at a temperature below that of luminosity.

**Thermolysis.**—The decomposition of a molecule by heat.

**Thermo-Magnetic Generator.**—(1) A device for producing electricity by the combined influence of heat and magnetism. (2) A pyro-magnetic generator.

**Thermo Magnetic Motor.**—A pyro-magnetic motor.

**Thermometer, Electric.**—A device for determining the effects of an electric discharge by the movements of a liquid column due to the expansion of a confined mass of air through which the discharge is passed.

**Thermometric Conductivity.**—The ratio of the calorimetric conductivity to the specific heat of unit volume.

**Thermometric Heat.**—A term proposed for heat in gross matter, as distinguished from radiant heat, or wave motion in the ether.

**Thermometric Resistance Coil.**—A coil whose resistance is known at a given temperature, and employed to determine an unknown temperature to which it is exposed, from the change in its resistance.

**Thermometry.**—That branch of science which treats of the determination of temperature.

**Thermo-Multiplier.**—(1) A word sometimes used for thermo-pile. (2) A form of low-resistance galvanometer suitable for use in connection with a thermopile.

**Thermo-Pair.**—A thermo-electric couple.

**Thermophone.**—(1) An electric instrument for producing sound by means of electricity. (2) Any instrument by means of which sounds are produced by the absorption of radiant energy.

**Thermo-Pile.**—A thermo-electric battery.

**Thermo-Pile Galvanometer.**—A form of galvanometer for detecting small differences of temperature, in which the thermo-pile is placed within the instrument.

**Thermoscopic Receiver.**—A name sometimes given to a microphonic receiver.

**Thermostat.**—An instrument for automatically maintaining a given temperature by closing an electric circuit through the expansion of a solid or liquid.

**Thermostatic Alarm, Electric.**—Any electric alarm operated by the action of a thermostat.

**Thermostatic.**—Of or relating to a thermostat.

**Thermostatic Regulation.**—Any regulation, such as in the temperature of a room, effected by the action of a thermostat.

**Thermostatic Regulator.**—A regulator whose action is dependent on a thermostat.

**Thermo - Telephone.**—(1) A telephone transmitter consisting of a continuous wire, one end of which is connected with a transmitting diaphragm placed in circuit with the receiving telephone battery, and having a current passed through it of sufficient strength to heat the wire. (2) A telephone receiver in which the diaphragm is set in vibration by thermally-produced changes in the length of an attached wire.

**Thermo-Tropic Battery.**—A name proposed for a form of carbon battery, in which the E. M. F. is produced by the action of heat.

**Thermo-Tropic Current.**—The currents produced by a thermo-tropic battery.

**Thief Alarm.**—A term sometimes employed for a burglar alarm.

**Third-Rail Electric Railway.**—An electric street-car railway in which a third rail, insulated from the track, is employed for one side of the circuit, the outside rails, together with return feeders, being employed for the other side of the circuit.

**Thimble Brush.**—A suitably shaped brush employed for cleansing such surfaces as the inside of a thimble, and so preparing them for electro-plating.

**Thomson.**—A name proposed, but not adopted, for a unit of electric conductivity.

**Thomson Effect.**—(1) The production of an electromotive force in unequally heated homogeneous conducting substances. (2) The increase or decrease in the differences of temperature in an un-

equally heated conductor, produced by the passage of an electric current through the conductor.

**Thomson's Bridge.**—A modified form of Wheatstone's bridge employed for the measurement of very small resistances.

**Three Ammeter Method of Measurement.**—A method of measuring activity in an alternating-current circuit by the combined use of three ammeters in a main and branch circuits respectively.

**Three-Bearing Generator.**—(1) A belt-driven dynamo-electric generator, provided with a third shaft bearing situated between the armature and the pulley. (2) A generator whose rotor shaft has three bearings.

**Three-Bearing Motor.**—(1) A belt-driving motor provided with a third shaft bearing between the pulley and the armature. (2) A motor whose rotor shaft has three bearings.

**Three-Bearing Railway Generator.**—A railway-generator having three bearings for its rotor shaft.

**Three-Bladed Switch.**—(1) A switch provided with three blades. (2) A switch closing three circuits simultaneously.

**Three-Branched Spark.**—A form of branched spark obtained by the discharge of a Leyden jar through a peculiar form of induction coil.

**Three - Circuit Way - Telegraphic Switchboard.**—A form of telegraphic switchboard suitable for use at a way station.

**Three-Coil Armature Winding of Alternator.**—An armature winding providing three coils in a ring armature or three slots in a drum armature for each and every pole in the field frame.

**Three-Coil Armature Winding of Multiphase Alternator.**—An armature winding providing three coils in a ring armature or three slots in a drum armature, per phase, for each and every pole in the field frame.

**Three Corner Telegraphic Repeater.**—A telegraphic repeater which repeats from one circuit to two circuits.

**Three-Current Test to Instrumental Zero.**—A localization submarine cable test, in which three separate measurements of resistance are made with different current strengths in succession, the Wheatstone bridge balance being taken to instrument zero.

**Three-Filament Incandescent Lamp for Triphase Circuits.**—An incandescent lamp intended for use on triphase

circuits provided with three leading-in wires connected to the free ends of three filaments which are connected in a common joint.

**Three-Part Commutator.**—A commutator made up of three insulated segments.

**Three-Phase Armature.**—An armature possessing a three-phase winding.

**Three-Phase Armature-Winding.**—An armature winding such as will enable it to produce three-phase currents.

**Three-Phase Bar-Winding for Armature.**—A bar winding for an armature, such as will enable it to produce three-phase currents.

**Three-Phase Circuit.**—Any circuit suitable for the transmission of three-phase currents.

**Three-Phase Coil-Winding for Armature.**—A coil winding for an armature, such as will enable it to produce three-phase currents.

**Three-Phase Continuous-Current Commutating Machine.**—A transformer from triphase alternating to continuous currents, employing a revolving armature provided with a commutator. (2) A triphase rotary transformer.

**Three-Phase Currents.**—Three alternating currents differing in phase from one another by one-third of a cycle.

**Three-Phase Dynamo.**—A three-phase generator.

**Three-Phase Generator.**—Any generator capable of producing three-phase currents.

**Three-Phaser.**—A three-phase generator.

**Three-Phase Meter.**—A meter suitable for operation on a three-phase system, for recording the energy delivered on all three branches.

**Three-Phase Motor.**—Any motor suitable for operation by three-phase currents.

**Three-Phase Rotary Converter.**—A rotary converter suitable for use in connection with three-phase currents.

**Three-Phase Rotating-Magnetic Field.**—A rotating field produced by the action of a three-phase current.

**Three-Phase System.**—A system for the transmission of electric energy by means of three-phase currents.

**Three-Phase Transformer.**—Three separate transformers employed for the transformation of triphase currents.

**Three-Phase Transmission.**—Transmission by means of three-phase currents.

**Three-Phase Two-Phase Transformer.**

An alternating-current transformer for transforming from three-phase currents to two-phase currents.

**Three-Phase Working.**—Three-phase transmission.

**Three-Phaser.**—(1) A three-phase generator. (2) A triphaser.

**Three-Point Switch.**—(1) A switch by means of which a circuit can be completed through three different contact points. (2) A switch designed to make three distinct contacts.

**Three-Point Trolley Switch.**—A trolley switch provided for a bifurcation in a road, or where a road divides into three branches.

**Three-Voltmeter Method of Measurement.**—A method of measuring activity in an alternating-current circuit, employing three voltmeters simultaneously.

**Three-Way Frog.**—A three-way trolley frog.

**Three-Way Plug.**—A multiple telephone switchboard plug making three contacts at sleeve, ring and tip respectively.

**Three-Way Switch.**—A three-point switch.

**Three-Way Trolley-Frog.**—A trolley frog used where a trolley line branches in three directions.

**Three-Way Trolley-Switch.**—(1) A trolley switch designed for use at a point where the line branches in three directions. (2) A trolley switch with three connections.

**Three-Wire Circuit.**—(1) A circuit employed in a three-wire system. (2) A three-wire diphasic system. (3) A three-wire triphase system.

**Three-Wire Diphasic.**—A form of diphasic circuit containing three wires, in which one of the wires is usually provided with a greater area of cross-section and is employed as the common return.

**Three-Wire Distribution Board.**—A distribution board in a three-wire system.

**Three-Wire Mains.**—The mains employed in a three-wire system of distribution.

**Three-Wire Motor.**—A meter suitable for operation on a three-wire system for recording the power delivered on both sides of the system.

**Three-Wire Moulding.**—Moulding employed in a three-wire distribution system.

**Three-Wire Multiple Switchboard.**—A multiple telephone switchboard in which the jacks in a subscriber's line are



connected in multiple, and in which three wires run to all jacks.

**Three-Wire Switchboard.**—(1) A telephone switchboard with three wires to each jack. (2) A switchboard employed in a three-wire system of electric distribution.

**Three-Wire Switchboard.**—A switchboard suitable for use in connection with a three-wire system of distribution.

**Three-Wire System.**—A system of electric distribution for lamps or other multiple-connected translating devices, in which three conductors are employed in connection with two dynamos connected in series, the central or neutral conductor being connected to the junction of the dynamos, and the two other conductors to the remaining free terminal of each.

**Three-Wire Transmission.**—(1) Transmission by the three-wire system. (2) Transmission by means of the three-wire diphasic or three-wire triphasic systems.

**Three-Wire Telephone Switchboard.**—A branched terminal telephone switchboard.

**Throttling.**—Partially or completely cutting off.

**Throttling of Lines of Magnetic Force.**—Any decrease in the density of magnetic flux due to a magnetic joint, or to any decrease in the magnetic permeability of any portion of a circuit. (2) Saturation.

**Through.**—(1) In communication with, telegraphically. (2) Directly connected telegraphically, without intermediate stations. (3) Completed or ended.

**Through Circuit.**—A telephonic or telegraphic circuit that has been completed through to a given station, by cutting out interruptions or breaks in a line, by the connection together of sections of different wires.

**Through Line.**—A line extending between two terminal stations, as distinguished from a line containing way stations.

**Through Telephone Tablets.**—Panels placed in a telephone switchboard for connecting subscribers on different switchboards.

**Throw.**—A term sometimes employed for the excursion or throw of a needle.

**Throw of Needle.**—A phrase sometimes employed for the angular deflection of a needle, particularly when the needle makes its first swing.

**Throw-Back-Indicator, Electric.**—An annunciator with a drop that is automatically replaced.

**Throw-Over Reversing Switch.**—A reversing switch which is operated by throwing it over from one side to the other.

**Throw-Over Starting Switch.**—A throw-over switch employed for starting an electric motor.

**Throw Over Switch.**—(1) A switch for readily and rapidly changing a circuit from one source to another or one system to another. (2) A switch which is thrown over from one set of contacts to another, by movement about an axis.

**Thumb-Cock Electric Burner.**—An electric gas-burner in which the turning of an ordinary thumb-cock turns on the gas and ignites it by a spark produced by a wiping contact, actuated by the motion of the thumb-cock.

**Thunder.**—The loud noise accompanying a disruptive lightning discharge.

**Thunder Rod.**—A term formerly employed for lightning rod.

**Thunder Storm.**—A rain storm accompanied by thunder and lightning.

**Ticker.**—A word sometimes employed for stock ticker, or printing telegraph.

**Ticket Operator.**—In telephony, an operator at a central exchange whose duty is to record calls on tickets for that purpose.

**Tie Bar.**—A bar extending across the track at suitable intervals between two opposite rails, and employed to prevent the spreading of the rails.

**Tie Feeder.**—A feeder connecting two stations, two feeders, or two feeding points.

**Tie Line.**—(1) In an electric distributing system, a conductor free from translating devices and employed to equalize potential. (2) A conductor connecting two points in a distributing system for the purpose of equalizing their potential.

**Tie Sleeper.**—A sleeper laid transversely to a track and serving to retain in place the rails which are fastened to it.

**Tie Wire.**—(1) Binding wire of an insulator. (2) Wire which binds an overhead wire to the groove of its insulator.

**Time Annunciator.**—An alarm clock.

**Time-Ball, Electric.**—A ball suspended in a prominent position on a tall pole and caused to fall at the exact hour of noon, or at any other pre-determined time for the purpose of giving a visual signal of correct time to an entire neighborhood.

**Time Constant.**—(1) In an electric circuit the ratio of the inductance to the con-



ductor resistance. (2) In an electric circuit containing a condenser the product of the capacity of the condenser, and the resistance of its discharging circuit.

**Time-Constant of Circuit.**—(1) The time in which a current will fall in a circuit when the E. M. F. is suddenly removed, in a ratio whose Napierian logarithm is unity. (2) The ratio of the inductance of a circuit to its resistance.

**Time-Constant of Condenser.**—The time in which the charge of a condenser falls in a ratio whose Napierian logarithm is unity.

**Time-Constant of Electro-Magnet.**—The time required for the current to fall, when the E. M. F. is suddenly withdrawn, to a ratio whose Napierian logarithm is unity.

**Time Cut-Out.**—An automatic cut-out arranged so as to permit a translating device to operate for a certain time, after which it is cut out of the circuit.

**Time Detector, Electric.**—An electrically operated watchman's clock. An apparatus for electrically registering the time at which a watchman visits one or more stations and closes or opens a circuit connected with the register.

**Time Fall of Electromotive Force of Secondary Cell.**—A gradual decrease in the potential difference of a secondary or storage cell observed during its discharge.

**Time Flow.**—The ratio expressed in ergs-per-square-centimetre, of the amount of energy which is passed through a normal area of cross-section, to that cross-section.

**Time Gun.**—A gun that is automatically fired by a standard clock, for the purpose of giving a time signal to an entire neighborhood.

**Time Hysteresis.**—A term sometimes incorrectly employed for magnetic creep-lag.

**Time-Illumination.**—(1) A given illumination that is continued for a given time. (2) The effect produced by an illumination continued for a time. (3) The product of illumination and time.

**Time-Lag of Magnetization.**—(1) A lag which appears to exist between the time of the action of the magnetizing force, and the appearance of the magnetism. (2) In an alternating-current choking-coil or transformer, the lag of magnetization due to hysteresis, expressed as a time or fraction of a period.

**Time Meter, Electric.**—An electric meter whose operation is based on a record of

time during which an electric current is passing.

**Time of Oscillation.**—The time of vibration.

**Time of Vibration.**—The time required for a complete to-and-fro motion of the particles of an elastic medium.

**Time Register.**—Any device for registering a lapse of time.

**Time Register for Railroads.**—A telegraphic apparatus or register designed to record a telegraphic message transmitted over a line.

**Time Relay.**—(1) A relay employed in a form of stock ticker for momentarily delaying the releasing of a clutch and the closing of a transmitter, until the printing of a given letter has been assured. (2) A relay employed in a system of time signalling.

**Time-Rise of Electromotive Force of Secondary Cell.**—A gradual increase in the potential difference of a secondary or storage cell observed during charge.

**Time Switch.**—(1) A switch arranged to open or close a circuit at a certain time or after the lapse of a certain time. (2) An automatic switch in which a predetermined time is required either to insert a resistance into or remove it from a circuit.

**Time Telegraph.**—A general term for the apparatus employed in time telegraphy.

**Time Telegraphy.**—A system for the telegraphic transmission of time.

**Tinned Wire.**—Wire electro-plated with tin.

**Tinning Metal.**—The solder employed in joining electrotypes or for preparing their backs for the reception of the backing metal.

**Toe of Grapple.**—A prong of a cable grapple.

**Toll Station.**—A pay telephone or telegraph station.

**Toll System.**—A system of charging for telephone communications based upon telephone calls, as distinguished from a charge based upon rental.

**Tone.**—Any musical note of a definite frequency.

**Tongue of Relay.**—The tip or extremity of the armature, carrying a contact point.

**Tooling.**—The operation of shaping a gutta-percha covered joint by the application of a warm tool to its surface.

**Toothed-Core Armature.**—A laminated armature-core whose toothed discs pro-

vide longitudinal grooves on the surface of the armature for the reception of the armature coils.

**Toothed Core Discs.**—The discs employed in a toothed-core armature.

**Toothed-Drum Armature.**—A drum-shaped form of toothed-core armature.

**Toothed-Ring Armature.**—A ring-shaped form of toothed-core armature.

**Top-Hat Curve.**—A curve of electromotive force, current or flux which has the shape of a top hat, that is, in which the value is fairly constant for a considerable time at its maximum rise and fall.

**Topler-Holts Machine.**—A form of electrostatic induction, or influence, machine.

**Torch Signalling.**—A form of flash signalling.

**Tore.**—A toroid.

**Toroid.**—A solid of revolution bounded by a surface generated by revolving any closed plane curve about an axis in its plane which does not cut it.

**Toroidal Coil.**—(1) A coil wound in the form of a toroid. (2) A closed circular solenoid.

**Toroidal Current-Sheet.**—A uniform current-sheet having the form of a toroid.

**Torpedo Boat.**—A boat used for carrying and discharging torpedoes.

**Torpedo Cable.**—(1) A cable in the circuit of which a torpedo fuse is placed. (2) A cable designed for use with a torpedo.

**Torpedo, Electric.**—(1) A name sometimes given to an electric ray. (2) An electrically operated torpedo.

**Torpedo Nets.**—Steel-wire netting suspended from or attached to a ship's side for the purpose of ensuring protection against moving torpedoes.

**Torquo.**—(1) The moment of a force applied to a dynamo or other machine which causes its rotation. (2) The mechanical rotary or turning force which acts on the armature of a dynamo-electric machine, or motor, and causes it to rotate. (3) The ratio of the mechanical activity of a motor, at its belt or pulley, to the angular velocity.

**Torque Efficiency.**—The ratio of the torque exerted by a motor at a given input or terminal electric activity, to the torque it would exert if it were a perfect machine and had no loss of energy.

**Torqueless Stress.**—A twistless stress, or stress which produces no torque.

**Torrællian Vacuum.**—The vacuum which exists above the surface of the

mercury in a barometer tube, or other vessel over thirty inches in vertical height, which has been filled with boiled mercury and inverted below the surface of the mercury in a vessel.

**Torsibility.**—Possessing the ability of being torsed or twisted.

**Torsion.**—The twisting of a body by the application of a torsional force.

**Torsion Galvanometer.**—A galvanometer in which the strength of a deflecting current is measured by the torsion exerted on the suspension system.

**Torsional Rigidity of Fibres.**—The elastic couple set up in a fibre per unit of twist.

**Torsional Vibration.**—The vibration produced in a solid body by torsion.

**Total Candle-Power.**—A term sometimes used for the total quantity of light emitted by any luminous source.

**Total Contact.**—A full or metallic contact.

**Total-Current-Panel of Switchboard.** That panel of a switchboard which is provided with devices for measuring and controlling the total current generated by a station.

**Total Disconnection.** (1) Any disconnection effected by the opening of a switch or the actual breaking of a circuit. (2) A complete loss of continuity in a circuit.

**Total Earth.**—A term sometimes used for dead earth.

**Total Efficiency of Luminous Source.** The ratio of the luminous rays to the total energy expended.

**Total Intensity of Earth's Magnetism.** (1) The resultant or entire force of the earth's magnetism, as distinguished from the horizontal or vertical components. (2) The flux density of the earth's magnetism.

**Total Magnetic Induction.**—(1) The number of lines of magnetizing force which pass through any space where magnetizable material is placed, together with the lines added by the magnetization of the magnetic material. (2) Total magnetic intensity, or induction density, in a magnetized substance.

**Total Resistance.**—The sum of the resistances of a circuit.

**Tourmaline.**—A crystalline body consisting of natural silicates and borates of alumina, lime, iron, etc., possessing pyroelectric properties.

**Tourniquet, Electric.**—A term sometimes used for an electric flyer.

**Tower, Electric.**—A high tower, provided in systems of tower illumination, for the support of a number of electric arc-lamps.

**Tower-System of Electric Lighting.**—The lighting of extended areas by means of arc lights placed on the tops of tall towers.

**Tower Wagon.**—The repair wagon employed on trolley lines, and provided with a structure for enabling the workmen to conveniently reach the trolley wires.

**Towing, Electric.**—Electric hauling of canal boats.

**Towing Torpedo.**—A torpedo arranged to be towed after a vessel, and exploded when it strikes the side of an enemy's vessel.

**Track Bond.**—A rail bond.

**Track Instrument.**—An electric contact capable of being closed by a train moving over it, placed by the side of a railroad track, and employed to sound an alarm or indicate at a distance the presence of the train.

**Track Joint.**—A rail joint.

**Track Switch.**—(1) A switch for leading a car from one track to another. (2) A mechanical switch in the rail of a street-car track for changing the route of a car.

**Track-to-Dynamo Bonding.**—A method of bonding in which a track of positive polarity is bonded to the negative side of a dynamo.

**Traction, Electric.**—The propulsion of a car, or other vehicle, by the action of an electric motor.

**Trailer.**—(1) An ordinary car attached to a trolley car and drawn after it. (2) Any car hauled by a motor car.

**Trailer Grapnel.**—A second or following grapnel attached to and travelling behind an ordinary grapnel.

**Trailing Pole.**—(1) The following pole edges of a dynamo-electric machine. (2) The pole edges of a dynamo-electric machine, from which a point on the surface of the armature moves when midway between the poles.

**Train Descriptor.**—(1) An electric contrivance arranged for automatically indicating the position of trains on a railroad. (2) In a system of block signalling by electricity, an instrument for indicating at a distance the character of a train which is being sent along the line.

**Train Wire.**—A line wire connected with the general dispatcher's office, employed

in a block system of railroads, and used for sending train orders only.

**Trajectory.**—(1) The curve described by a projectile thrown obliquely upwards. (2) A curve which cuts, according to a given law, a system of curves obtained by varying a parameter.

**Tramcar, Electric.**—A term applied to an electric trolley car.

**Tramway, Electric.**—A term applied to an electric railway.

**Trans-Continental Telephony.**—Telephonic communication established across a continent.

**Transfer Board.**—In telephony, a switch-board at which calls are transferred from one junction line to another.

**Transfer Bus-Bar.**—A bus-bar that is employed to gradually transfer a feeder from one bus-bar to another, without the sudden variation of potential which would occur if it were thrown over directly.

**Transfer Operator.**—In telephony, an operator at a transfer board.

**Transform.**—(1) To change or convert. (2) To change or convert the electromotive force, and, consequently, the current strength in a circuit, by any means. (3) To change the type of a current, as from an alternating into a continuous current.

**Transformation.**—The act of transforming or changing.

**Transformation of Electromotive Force or Current.**—A change in the value of an electromotive force or current by any means.

**Transformation of Electric Force.**—(1) Transformation of electromotive force. (2) Transformation of electric energy into some other form of energy.

**Transformation of Heat.**—Transformation of heat energy into any other form of energy.

**Transformer.**—An induction coil employed either for raising or for lowering electric pressure.

**Transformer Connection Board.**—A board employed on a transformer for ease in changing or inter-connecting its circuits.

**Transformer Controller.**—(1) An apparatus for operating or controlling a transformer. (2) A controller of pressure operated on the principle of an alternating-current transformer.

**Transformer Fuse.**—A fuse employed either in the primary or secondary circuit of a transformer.



**Transformer Fuse-Block.**—A fuse-block in or near a transformer case.

**Transformer Guard.**—(1) A transformer lightning guard. (2) Any device for automatically grounding the secondary of a transformer on its accidental contact with the primary.

**Transformer Indicator-Diagram.**—A set of diagrams automatically recorded on a card, which give the instantaneous values of the current and electromotive force of a transformer circuit.

**Transformer Lightning-Arrester.**—A form of lightning arrester designed for the protection of transformers.

**Transformer Lightning Guard.**—A transformer lightning-arrester.

**Transformer Motor.**—An induction motor.

**Transformer Secondary Connection Board.**—A separate transformer connection board provided for its secondary circuits.

**Transformer Stampings.**—Sheet steel stampings of such shape as is suitable for building up the laminated core of a transformer.

**Transformer Sub-Station.**—A sub-station where a number of transformers are grouped, designed as a sub-centre of distribution.

**Transforming.**—(1) Changing electric energy from lower pressure and higher current to higher pressure and lower current or vice-versa. (2) Changing the character of a current.

**Transforming Currents.**—Changing the value of the current strength in any circuit, with a corresponding opposite change in pressure.

**Transforming Down.**—Lowering the pressure in a distribution circuit by means of a step-down transformer.

**Transforming Station.**—(1) In a system of distribution by transformers, a station other than a central station, where a number of transformers are placed in order to supply a group of houses in that neighborhood. (2) A transformer sub-station.

**Transforming Up.**—Raising the pressure in a distribution circuit, by means of a step-up transformer.

**Transient.**—(1) Momentary. (2) Lasting or enduring but for a short time.

**Transient Currents.**—Currents that are of but momentary duration.

**Transient Magnetomotive Force.**—(1) A momentary magnetomotive force. (2)

A magneto-motive force produced by the momentary passage of an electric current.

**Trans-Illumination.**—Such an illumination of an interior cavity of the body as to permit it to be visible through the intervening portions of the body as a translucent screen.

**Transition Layer.**—A layer marking the separation of two homogeneous bodies at which the electric or magnetic properties pass with great rapidity from one value to another.

**Transition Resistance.**—(1) A term sometimes used in electro-therapeutics for a change in the value of a resistance caused by polarization. (2) Resistance residing in the contact surface between a solid and a liquid, or between two solids.

**Translator.**—A telegraphic translator or repeater.

**Translating Commutator.**—A term sometimes used for translation commutator.

**Translating Device.**—A name frequently given to an electro-receptive device.

**Translating Telegraphic Station.**—(1) A receiving station. (2) Any station at which a telegraphic message is automatically repeated into another circuit.

**Translation Commutator.**—A name sometimes given to a switch on a translating board.

**Translation Lag.**—A lag due to the traverse of an active conductor past a magnet pole, whereby the current in the conductor is displaced in the direction of the motion, and produces a moving field, the iron mass or body tending to accommodate itself to the direction of the flux in the moving field.

**Translator.**—An orthography for translator.

**Translator Keys.**—Keys employed in a translator for signalling on either circuit.

**Translucence.**—Possessing the property of transmitting light but of preventing the outlines of objects from being seen.

**Translucent.**—Possessing the property of translucence.

**Translucent-Disc Photometer.**—A photometer in which the light to be measured is placed on one side of a partly translucent and partly opaque disc, and the standard candle, or other photometric standard, is placed on the opposite side, the intensity of the light being estimated by the distance of the lights from the disc, when an equal illumination is obtained over both surfaces.



**Transmission Circuit, Electric.**—The circuit employed to receive the apparatus necessary in any transfer of electric energy from the generators to the receptive devices.

**Transmission Dynamometer.**—A dynamometer in which the mechanical power that is measured is transmitted to some machine, as distinguished from a dynamometer which measures and at the same time absorbs the energy.

**Transmission, Electric.**—The transference of energy from one point to another by means of electric currents.

**Transmission Insulator.**—(1) An insulator employed on transmission lines. (2) A high-tension insulator.

**Transmission Line.**—A transmission circuit.

**Transmission of Energy.**—The transference of energy from one point to another.

**Transmission of Electric Energy.**—The transference of electric energy from one point to another.

**Transmitted Power.**—Power that is transferred from one point to another.

**Transmitter, Electric.**—(1) A general name applied to the various electric apparatus employed in telegraphy or telephony to transmit or send electric impulses over a line wire or conductor. (2) Any electric-transmitting instrument, as distinguished from a receiving instrument.

**Transmitting Magnet.**—The magnet employed in any transmitting instrument.

**Transmitting Station.**—A station from which any electric signals or impulses are sent.

**Transposing.**—In a system of telephonic communication, a device for avoiding the bad effects of mutual induction, by alternately crossing equal lengths of consecutive sections of the line.

**Transposition.**—The transposing of a telegraph or telephone circuit.

**Transposition Insulator.**—A special form of insulator provided for the ready transposition of a telephone circuit.

**Transposition Joints of Telephone Circuit.**—The joints employed on a telephone circuit at the transposition insulators.

**Transverse Electromotive Force.**—An electromotive force excited by a magnetic field in a substance in which electric displacement is occurring.

**Transverse Vibration.**—A vibration in

an elastic medium in which the successive particles move at right angles to the direction in which the wave is progressing through the medium.

**Travelling Derrick.**—A derrick supported on girdleways, on a platform over which it is movable, provided for shifting or moving heavy masses through short distances.

**Travelling Dynamo.**—A dynamo mounted on a movable platform.

**Travelling Motor.**—(1) A motor placed on a movable car or carriage, as distinguished from a stationary motor. (2) A locomotor.

**Travelling of Arc.**—An unsteadiness produced in the light of a carbon arc occasioned by the shifting of the position of the arc between the electrodes.

**Traversing Motor, Electric.**—(1) A motor which moves regularly to-and-fro, through a limited distance. (2) In an electrically operated crane, the motor which operates the traverser.

**Tread of Car Wheel.**—The running face of a car wheel, or the part that comes in contact with the surface of the track.

**Treated Coke Filament.**—A coke filament of an incandescent lamp that has been subjected to the flashing process.

**Tree-System of Parallel Distribution.**—A system of parallel distribution of incandescent lamps, in which the main conductors of the system resemble the trunk of a tree, and the auxiliary leads branch in various directions, somewhat after the fashion of a spreading tree, the lamps occupying the place of the twigs, leaves and fruit.

**Tree Insulator.**—(1) An insulator placed on a tree for the support of an aerial wire. (2) A variety of insulator suitable for attachment to trees, and designed so as to keep the conductor in normal position, despite the movement of the tree.

**Tree Wire.**—A special form of insulated wire designed to resist the abrasion of the insulating substance, when rubbed against a rough surface, like the bark of a tree.

**Trege.**—A prefix for a trillion, or one million million, or  $10^{12}$ .

**Tregadyno.**—A trillion dynes, or roughly the weight of a thousand tons.

**Tregorg.**—One trillion ergs, or 73,730 foot-pounds at Greenwich; or, approximately, 33 foot-tons.

**Tregohm.**—One trillion ohms, or one million megohms.

**Tregohm Galvanometer.**—A galvanometer which gives unit deflection through a resistance of one tregohm, in circuit with one volt.

**Trembler.**—A name sometimes applied to a trembling bell.

**Trembler Bell.**—A trembling bell.

**Trembling Bell.**—A form of vibrating or automatic make-and-break contact bell.

**Trevelyan Effect.**—A musical note emitted under certain circumstances when a mass of heated copper is supported on thin edges on a block of cold lead.

**Triad Atom.**—An atom whose valency or atomicity is three.

**Triangular Triphase Winding.**—A word sometimes employed for the inter-linked or three-wire triphase.

**Triangular Triphaser.**—A triangularly wound triphaser.

**Tricero.**—A prefix signifying one trillionth part, or  $10^{-12}$ .

**Tricero-Ampere.**—The one trillionth of an ampere.

**Tricero-Parad.**—The one trillionth of a farad.

**Tricron.**—One trillionth of a metre, or  $10^{-12}$  metre.

**Tricrohm.**—The one trillionth of an ohm.

**Trifilar Suspension.**—A suspension supported by three parallel fibres.

**Trigonometrical.**—Of or pertaining to trigonometry, or the science of angles, their relations, and properties.

**Trigonometrical Functions.**—Certain quantities definitely related to angles considered as independent variables.

**Trigonometrically.**—In a trigonometrical manner.

**Trigonometry.**—That branch of mathematical science which treats of angles and their properties, in triangles or otherwise.

**Trimmer.**—A name sometimes given to a man who recarbons electric arc-lamps.

**Trimming a Lamp.**—Re-carboning an arc lamp.

**Trimming a Wire.**—(1) Preparing a wire for jointing or connecting to an instrument. (2) Baring a wire of insulation and cleansing its conducting surface.

**Triode Working.**—A three-way mode of telegraphic working by the Delany synchronous multiplex telegraphic system.

**Trip Indicator.**—A form of indicator in which the indicator arm or drop is disengaged by the tripping action produced by

the movement of the armature of an electromagnet.

**Triphase.**—A word frequently employed for three-phase.

**Triphase Armature.**—A three-phase armature.

**Triphase Armature-Windings.**—Three-phase armature windings.

**Triphase Circuit.**—A three-phase circuit.

**Triphase-Current.**—A three-phase current.

**Triphase Dynamo.**—A dynamo capable of producing three-phase currents.

**Triphase Generator.**—A triphase dynamo.

**Triphase Motor.**—A motor capable of being operated by triphase currents.

**Triphase Rotary-Field.**—A rotary field produced by the simultaneous action of triphase currents.

**Triphase Rotary-Transformer.**—A rotary transformer operated by, or producing three-phase currents.

**Triphase Rotating-Magnetic Field.**—A triphase rotary field.

**Triphase Transformers.**—(1) Three separate transformers employed for changing the pressure on triphase circuits. (2) A single transformer having three separate triphase windings.

**Triphase Alternating-Currents.**—Three uniphase alternating-currents whose phases are displaced with regard to one another by one-third of a cycle.

**Triphaser.**—A triphase generator.

**Triple-Carbon Arc-Lamp.**—An arc lamp in which three carbon electrodes are used.

**Triple Connector.**—A connector suitable for uniting the ends of three wires.

**Triple Petticoat Insulator.**—An aerial line insulator provided with a triple petticoat.

**Triple-Pole Single-Throw Switch.**—A single-throw switch having three blades, and intended for closing three circuits simultaneously.

**Triple-Pole Switch.**—(1) A switch consisting of a combination of three separate switches for opening or closing three circuits at the same instant. (2) A switch employed to open or close three contacts. (3) A switch employed to open or close triphase circuits.

**Triple-Truck Support.**—(1) A support for a car body, consisting of three separate trucks. (2) A radial-truck support,

**Triplex Telephony.**—(1) The simultaneous telephonic transmission of three distinct messages over the same wire in the same direction.

**Triply Re-Entrant Armature Winding.**—An armature winding provided with three independent conducting paths or windings each of which is separately re-entrant.

**Tripod Roof Support.**—A roof-top support for a telegraph line, in the shape of a tripod.

**Tripping Coil.**—A coil forming part of the mechanism of a circuit-breaker on the switchboard of a central railroad station, so arranged that when the current has reached a certain predetermined value, limited by the action of a solenoid, the tripping mechanism is operated, thus breaking the circuit.

**Trivalent.**—Possessing an atomicity or valency of three.

**Trolley.**—A rolling contact-wheel that moves over a trolley line and carries off the current required to drive the motor cars.

**Trolley Base.**—A base provided for the support of a trolley pole, and furnished with springs to preserve a firm contact between the trolley and the trolley wire, and also provided with a swivel joint for readily reversing the direction of the trolley pole.

**Trolley Base-Framo.**—A trolley base.

**Trolley Bus-Bar.**—In a railway power station, the bus-bar connected with the trolley system, as distinguished from the bus-bar connected with the ground.

**Trolley Car.**—A motor car in a system of electric railroads employing a trolley system.

**Trolley Car-Controller.**—(1) A series-parallel controller. (2) A car-controller.

**Trolley-Contact.**—The contact secured between a trolley and the trolley wire.

**Trolley-Cord.**—The cord attached to the trolley pole or mast for removing it from and placing it on the line.

**Trolley-Crossing.**—(1) An insulating device, placed at the crossing of two trolley wires, by which the trolley, while running on one line may cross the other without coming into electrical contact with it. (2) A plate supported at the crossing of two trolley wires with guides to assist the trolley wheel across it.

**Trolley Crossing-Ear.**—An ear employed at a trolley crossing.

**Trolley Cross-Over.**—(1) An arrangement

for suspending the trolley wires at a trolley crossing. (2) A trolley crossing.

**Trolley Ear.**—A metal piece supported by an insulator, to which the trolley wire is fastened.

**Trolley Fork.**—The mechanism which mechanically connects the trolley wheel to the trolley pole.

**Trolley Frog.**—(1) The device to which the trolley wire is attached, employed for causing a car to deviate from one line to another. (2) A name given to the device employed in fastening or holding together the trolley wires at any point where the wires branch, and properly guiding the trolley along the trolley wire on the movement of the car over the track, under the action of the track switch.

**Trolley Guard.**—A trolley wire guard.

**Trolley Hanger.**—A device for supporting and properly insulating a trolley wire.

**Trolley Harp.**—The metallic frame placed on a trolley fork for supporting the trolley wheel.

**Trolley Ice-Clearer.**—A form of trolley wheel suitable for removing ice or sleet from a trolley wire.

**Trolley Insulator.**—A name sometimes applied to a trolley ear.

**Trolley Insulated Crossing.**—An insulated trolley crossing.

**Trolley Mast.**—A term frequently used for trolley pole.

**Trolley Mechanism.**—(1) The device employed for carrying the current from the trolley line to the motor in the car. (2) A general mechanism, including the trolley base, pole, wheel and rope.

**Trolley Pole.**—A pole, or mast, of wood or metal supporting the trolley and employed to carry a conductor from the car to the trolley wire.

**Trolley Section.**—(1) A single continuous length of trolley wire. (2) A portion of a trolley line insulated from adjoining portions and furnished with separate feed wires.

**Trolley Railway.**—An electrically operated railroad employing a trolley.

**Trolley Stand.**—(1) A word sometimes used for a trolley base. (2) A support provided for a trolley pole.

**Trolley Strain-Insulator.**—An insulator provided for the support of the strain wires.

**Trolley Strain-Wires.**—Wires employed for attachment to lugs in the anchor strain ear, for the purpose of maintaining the trolley line taut.



**Trolley Switch.**—(1) A switch placed on a track for the purpose of changing the car from one track to another. (2) An overhead switch provided at a turn of a trolley road for guiding the trolley to another line when the frogs on the track beneath have thrown the wheels of the car into another track.

**Trolley Three-Way Frog.**—A trolley frog used where the line branches in three directions.

**Trolley Traction.**—Electric traction by the trolley system.

**Trolley Truck.**—The truck supporting a trolley car and containing the car motors.

**Trolley Two-Way Frog.**—The ordinary V-shaped trolley frog.

**Trolley Wheel.**—(1) A metallic wheel connected with the trolley pole and moved over the trolley wire, for the purpose of taking therefrom the current required for driving the motor car. (2) The trolley.

**Trolley Wire.**—The bare overhead wire employed in a trolley system for supplying the driving current to the car motors through the intervention of the trolley mechanism.

**Trolley Wire Insulator.**—The insulator provided for the support of a trolley wire.

**Trolley Wire Splice.**—A joint or splice employed in joining two ends of trolley wires, consisting essentially in slipping the ends in a tubular conductor and then brazing them.

**Trop.**—A proposed unit of entropy equal to the quotient of one joule divided by one degree Centigrade.

**Truck for Car Motor.**—A support provided with wheels, and employed either singly, or in connection with one or more similar trucks, for the support of the car body.

**True Contact Force.**—The force or effect, distinguished from the voltaic effect which exists at the points of contact between two dissimilar metals.

**True Galvanometer Constant.**—The intensity of the field produced at the centre of a galvanometer coil by a unit current flowing through the coil.

**True Ohm.**—(1) An ideal ohm having the true theoretical value. (2) A term sometimes applied to the International ohm in contradistinction to the B. A. or legal ohm.

**True Power.**—In an alternating-current circuit the power which is represented by the true watts, as distinguished from

the apparent power, or that represented by the apparent watts.

**True Resistance.**—The resistance which a conductor offers to the passage of a current, by reason of its dimensions and resistivity, as distinguished from the spurious resistance produced by a counter electromotive force.

**True Watts.**—The activity in an alternating-current circuit, as given by the reading of a correctly calibrated wattmeter connected with such circuit.

**True Zero.**—An instrument or scale zero, as distinguished from a false zero of a galvanometer.

**Trumpet, Electric.**—An electro-magnetic buzzer whose sound is strengthened by a trumpet-shaped resonator.

**Trunion Screws.**—A pair of screws whose opposed points form the pivots of a movable shutter, armature, or other rotating device.

**Trunk Call.**—A telephone call transmitted through a trunk wire.

**Trunk Connection.**—A telephonic connection established through a trunk wire.

**Trunk Junction Board.**—A junction telephone switchboard for trunk wires.

**Trunk-Line Wires.**—(1) Through wires extended between two distant stations, provided with receiving and transmitting instruments at their ends only. (2) In telephony, main line wires connecting two terminal offices for connection to sub-offices or subscribers. (3) A main line wire connecting two important terminals for receiving telephone traffic.

**Trunk-Line Working.**—Telephone working embracing the use of trunk lines between central stations, as distinguished from lines connecting a central station with subscribers.

**Trunk Operator.**—In telephony, an operator at a trunk switchboard.

**Trunk Switchboard.**—In telephony, a switchboard at which trunk lines terminate.

**Trunk Wire.**—(1) A trunk line wire. (2) A main telephone wire. (3) A connecting wire running from town to town, or exchange to exchange, as distinguished from a wire connected permanently to a subscriber.

**Trunk Working.**—Telephonic or telegraphic transmission by means of trunk line-wires.

**Trunking-Out Telephone Switchboard.**—A form of telephone switchboard employed in long-distance working.



**Trunking Switchboard.**—A switchboard in which a few subscribers only are connected to the operator, thus enabling him to obtain any other subscriber by means of trunk wires extending to other sections.

**Trunking Telephone System.**—(1) A system of telephony employing trunk wires. (2) A system of telephony in which multiple switchboards are dispensed with, and all calls are trunked from the incoming to the outgoing panel.

**Trussed Pole.**—A pole which has been strengthened against lateral pull by the use of an outrigger and stays.

**Trussed Standard.**—A standard which has been strengthened to resist lateral stresses by the use of an outrigger and stays.

**Tube of Flow.**—A word sometimes used for a tube of force.

**Tube of Force.**—An imaginary tube in electrified or magnetized space, bounded by lines of electrostatic or magnetic force, and intersected by equipotential surfaces.

**Tube of Induction.**—In a space occupied by magnetic induction, an imaginary tube of induction flux bounded by induction lines.

**Tube of Magnetic Force.**—In magnetized space, a tube bounded by lines of magnetic force.

**Tubular Annunciator Drop.**—A special form of telephone annunciator-drop in the shape of a tube, and provided with an iron-clad magnet.

**Tubular Braid.**—A braid of fibrous insulating material, woven in the form of a tube, and provided for drawing over a joint after the two wires have been connected.

**Tubular Conductors.**—Conductors in the shape of tubes.

**Tubular Connectors.**—Connectors in the shape of tubes.

**Tubular Current.**—(1) A term sometimes applied to the current that traverses the superficial portions only of a solid conductor. (2) A current flowing through a tube, or having a distribution such as would be produced by flow through a tube.

**Tubular Electro-Magnet.**—An electro-magnet of a tubular form.

**Tubular Magnet.**—(1) A magnet in which a single coil enclosing a core is surrounded by an iron cylinder connected to the core at one end by an iron base or yoke. (2) A form of iron-clad magnet.

**Tumbler Switch.**—A switch provided with a double-contact knife-blade which can be readily depressed by the movement of a bolt lever placed at the top.

**Tumbling Box.**—(1) A rotating box in which metallic articles that are to be electro-plated are placed, so as to be polished by attrition against one another. (2) A rotating box in which rough castings are placed for smoothing their surfaces by attrition.

**Tuning-Fork Dynamo.**—An oscillatory dynamo.

**Tuning-Fork Interrupter.**—A reed interrupter.

**Tuning of Electric Circuit.**—Altering the period of a circuit, or varying either its capacity or self-induction, so as to bring it in resonance with another circuit.

**Tunnel Armature.**—An armature of a dynamo-electric machine in which the conductors are placed in holes, or nearly closed grooves, beneath the external surface of the core.

**Turnbuckle.**—(1) An appliance for straining span wires. (2) A screw tightener for a rod, guy, or line.

**Turn-Out.**—(1) A short section of single track which allows two cars to pass one another on a single track line. (2) A short side section placed at a station on a single-track road for switching a car off the main line so as to leave it clear.

**Turn-Table, Electric.**—A table suitable for show-windows revolved around a vertical axis by means of an electric motor.

**Turret-Turning Motor.**—A motor employed on board a war-ship for turning a gun turret.

**Turtle-Back Electro.**—A curved electrotype employed for use in cylindrical presses.

**Twigs.**—(1) A term sometimes applied to the branches or conductors connected with the sub-mains in a system of incandescent distribution. (2) Sub-branches.

**Twin-Carbon Arc-Lamp.**—A double-carbon arc-lamp.

**Twin Conductors.**—Two parallel conductors, laid side-by-side, and covered by a single coating of braid.

**Twin Filament Lamp.**—A double-filament lamp.

**Twin Wire.**—A conductor consisting of two separate conductors bound together by an insulating covering.

**Twin-Wire Circuit.**—A circuit formed of twin conductors.

**Twist System.**—A system of running overhead wires for the purpose of destroying magnetic inductive disturbances, and consisting in giving to the wires a helical twist as they run.

**Twist in Armature Leads.**—A displacement of the ends of the armature wires connected with the commutator segments, as regards the position of the coils on the armature, for the purpose of obtaining a more convenient position for the diameter of commutation, and, consequently, for the points of contact of the collecting brushes on the commutator.

**Twist in Leads.**—A twist given at regular intervals to the leads of twin conductors, for the purpose of avoiding the effects of induction.

**Twisted Bunched-Cable.**—A bunched cable, the separate conductors of which consist of twisted pairs placed in successive layers.

**Twisted Double-Conductors.**—A pair or a number of pairs of twisted twin conductors.

**Twisted Pair Cable.**—A cable containing one, several, or many twisted pairs of conductors, suitable for metallic circuits.

**Twisted Pairs of Conductors.**—An assemblage of twisted pairs of conductors, for metallic circuits.

**Twisted Strip-Voltmeter.**—A voltmeter consisting of a twisted strip of platinum-silver, and operating by the tendency of the strip to coil or uncoil when its temperature is changed by the passage through it of the current to be measured.

**Twisted Wire-Clip.**—A clip formed of a twisted wire.

**Twisted Wires.**—A term sometimes employed for transposed aerial telephone wires.

**Twisting Force.**—A term sometimes used for torque.

**Two-Bearing Generator.**—A generator whose rotor is provided with but two bearings, as distinguished from a three-bearing generator.

**Two-Bearing Motor.**—A motor whose rotor is provided with but two bearings, as distinguished from a three-bearing motor.

**Two-Circuit Armature-Winding.**—An armature winding which provides only two circuits through an armature between the commutator brushes, no matter how great may be the number of poles.

**Two-Circuit Dynamo.**—A dynamo provided with a two-circuit armature winding.

**Two-Circuit Multiple-Winding.**—A multiple winding on an armature, each component of which offers two circuits to the current.

**Two-Circuit Single-Wound Armature.**—A single-wound armature possessing two circuits independently of the number of poles and distinguished by the fact that the pitch is always forward.

**Two-Coil Armature-Winding of Alternator.**—A winding providing two slots in drum armatures or two coils in ring armature, for each and every pole in the field frame.

**Two-Coil Armature-Winding of Multiphase Alternator.**—A winding providing two slots in drum armatures, or two coils in ring armatures, per phase, for each and every pole in the field frame.

**Two-Fluid Voltaic Cell.**—A double-fluid voltaic cell.

**Two-Layer Armature-Winding.**—(1) A winding which is essentially applied in two layers. (2) A winding having more than two layers, but which would be capable of application in two layers only.

**Two-Liquid Cell.**—A term sometimes used for double-fluid cell.

**Two-Part Commutator.**—A commutator containing two segments suitable for commuting currents in a single coil rotated in a bipolar field.

**Two-Phase Alternator.**—A diphas alternator.

**Two-Phase Armature.**—A diphas armature.

**Two-Phase Circuit.**—A diphas circuit.

**Two-Phase Dynamo or Generator.**—A diphas generator.

**Two-Phase Motor.**—A diphas motor.

**Two-Phase Rotary-Transformer.**—A diphas rotary transformer.

**Two-Phase-Three-Phase Transformer.**—An alternating-current transformer for transforming from two-phase currents to three-phase currents.

**Two-Phase Transformer.**—A diphas transformer.

**Two-Phase Working.**—Transmitting electric power by means of diphas currents.

**Two-Phaser.**—(1) A generator of diphas or quarter-phase alternating-currents. (2) A diphaser.

**Two-Point Switch.**—A switch by means of which a circuit can be completed through two different contact points.

**Two-Point Trolley Switch.**—A trolley

switch provided for a bifurcation in a road.

**Two-Pole Dynamo-Electric Machine.**—A dynamo-electric machine whose field is produced by two poles.

**Two, Three, or Four-Conductor Cable.**—A cable containing two, three or four separate conducting wires.

**Two-Way Door-Trigger.**—A trigger which operates both when the door is opened and when it is closed.

**Two-Way Splice-Box.**—A splice box provided with two tubular conduits or ways.

**Two-Way Switch.**—A switch provided with two contacts connected with two separate and distinct circuits.

**Two-Wire Distributing Board.**—A distributing board for metallic circuits.

**Two-Wire Incandescent Lighting.**—Incandescent lighting from a single pair of mains, as distinguished from three-wire incandescent lighting.

**Two-Wire Mains.**—A name for the mains employed in the ordinary system of multiple distribution, as distinguished

from a three-wire main, or that used in a three-wire system.

**Two-Wire Moulding.**—A moulding provided with two grooves, and employed for the reception of two-wire mains or branches.

**Two-Wire Multiple-Switchboard.**—A multiple telephone switchboard in which the jacks of a subscriber's circuit are connected by two wires.

**Two-Wire Switchboard.**—A telephone switchboard with two-wire connections.

**Tying-In of Line Wire.**—Securing a line wire to its insulator.

**Type-Printing Telegraphy.**—Printing telegraphy.

**Type-Printing Telegraphic Transmitter.**—A transmitter employed in printing telegraphy.

**Typewriter, Electric.**—A typewriting machine in which the keys are only intended to make the contacts of circuits of electro-magnets, the attractions of whose armatures cause the movement of the type levers required for the work of printing.

## U

**U.**—A contraction sometimes employed for unit.

**Ultimate Capacity of Switchboard.**—The total number of subscribers that a multiple telephone switchboard can be made to accommodate.

**Ultimate Optical Efficiency.**—A term sometimes employed for the conditions required to ensure the greatest efficiency in the observation of small angular deflections of a suspended mirror by properly proportioning the dimensions of different parts of the system.

**Ultra-Gaseous Matter.**—(1) The peculiar condition of the matter which constitutes the residual atmospheres of high vacua. (2) Radiant matter.

**Ultra-Incandescent Lamp.**—An incandescent lamp in which the filament is covered with oxides of thorium, etc., so that their radiative powers are utilized by the glowing filament.

**Ultra-Thermal Lightning Arrester.**—An arrester for protecting instruments from unduly powerful currents, operated by the expansion of a metallic wire placed in the line circuit.

**Ultra-Ultra-Violet.**—A term proposed for luminous frequencies far beyond the violet in the spectrum.

**Ultra-Violet Rays.**—A term proposed for rays whose frequencies are greater than that of violet light.

**Ultra-Violet Spectrum.**—That portion of the spectrum which lies beyond the violet, or whose frequencies are greater than that of the violet.

**Umbrella Type of Generator.**—A type of generator in which an umbrella-shaped rotor is revolved around the stator or stationary element.

**Umbrella Springs.**—In telephone switchboard plugs, contact-springs pressing out sideways from the plug, like umbrella springs.

**Unbalanced Load.**—In a system of electric distribution, a load whose distribution is unsymmetrical.

**Unbalanced Polyphase System.**—A polyphase system in which the load and, therefore, the pressures and currents, are not symmetrically distributed.

**Unbattery.**—(1) To disconnect from a battery. (2) To remove a battery from a car

carriage, boat, building, device or receptacle.

**Unbuilding of Dynamo.**—The loss of magnetization of a dynamo field.

**Undemagnetizable.**—A term applied to an electro-magnetic railroad signal, whose signals are unreversible by atmospheric causes.

**Underframe.**—A truck of an electric motor car.

**Underground Cable.**—A cable suitable for being placed underground.

**Underground-Cable Support.**—(1) Any support provided in a subway for holding an underground cable. (2) A support provided for holding a cable where it passes around the side of a manhole, underground conduit, or other similar location.

**Underground-Cable Terminal.**—(1) The place where an underground cable emerges from the ground. (2) A cross-connecting or distributing board placed where an underground cable enters or leaves the ground, in order to facilitate the making and changing of the connections.

**Underground Conductor.**—An electric conductor placed underground, either by actual burial, or by passing it through underground conduits or subways.

**Underground Electric Conduit.**—(1) An underground pipe or tube provided with a number of separate ways or ducts for the reception of electric wires or cables. (2) An underground passage-way or space provided for the reception of electric wires or cables.

**Underground Electric Tube.**—An iron pipe containing three insulated conductors separated from one another and from the pipe by means of a bituminous insulating substance, employed in connection with the Edison three-wire system of distribution.

**Underground Railway.**—A name sometimes applied to an under-running trolley system.

**Underground Telegraph.**—(1) A telegraph, a large portion of whose circuit consists of underground wires or conductors. (2) A telephone cable provided for use underground.

**Underground Telephone Cable.**—A subterranean telephone cable, as distinguished from an aerial telephone cable.

**Underground Trolley System.**—A system of car propulsion in which the trolley wheel is replaced by a plow or sled that is pushed before, or drawn after,

the car along a trolley wire placed inside a slotted underground conduit.

**Underground Tube.**—An underground electric tube.

**Under-Running of Cable.**—The operation of passing a shallow-water cable over a boat, barge or vessel for the purposes of examination, by hauling the cable in at the bows, and allowing it to pass out at the same time over the stern; or, simply allowing it to run over a sheave while the boat is urged along the line of cable.

**Under-Running of Incandescent Lamps.**—The operation of incandescent lamps at a pressure below the normal.

**Under-Running Sheave.**—A supported sheave for the admission of a light of cable, and suitable for use in under-running as distinguished from a sheave through which an end must be passed.

**Under-Running Trolley.**—(1) A trolley wheel running under a wire in the usual way. (2) A word sometimes used for underground under-running trolley.

**Under-Running Trolley.**—A system of street-car propulsion in which the trolley wire is suitably supported in an underground slotted conduit, the current being taken off by means of a sled or shoe, pushed before or drawn after the car.

**Undertaker.**—(1) One who supplies electric energy to consumers. (2) A word sometimes used in electric lighting literature for those who are ready to deliver electric energy to consumers.

**Under-Type Magnet.**—A horse-shoe magnet of the vertical type, whose armature is placed near the lower end.

**Undulating Current.**—(1) A name sometimes given to an undulatory current. (2) A current of constant direction but continuously varying strength.

**Undulation.**—A wave or vibration, especially electric.

**Undulator.**—A form of rotating commutator employed for the use of transformers in continuous-current circuits. (2) A commutating device for the operation of alternating-current apparatus from a continuous-current circuit.

**Undulatory Currents.**—Currents of constant direction whose strength gradually changes.

**Undulatory Discharge.**—(1) A discharge whose strength gradually changes without change of direction. (2) A form sometimes used for an oscillatory discharge.

**Undulatory Winding.**—A name frequently given to a wave winding.



**Unevenly Distributed Armature Winding.**—A winding in which the slots do not recur at equal intervals around the periphery of the armature.

**Unflashed Filament.** A lamp filament that has not been subjected to the flashing process.

**Unfooting.**—A layer of broken stone, gravel and concrete, placed in layers and rammed, and employed at the bottom of a foundation trench for receiving the masonry work.

**Ungilding Bath.**—A stripping bath suitable for the removal of a coating of gold.

**Uni-Coil Alternating-Current Armature-Winding.**—A winding providing one slot or coil on the armature for each and every pole in the field frame.

**Uni-Coil Multiphase Armature-Winding.**—A multiphase armature winding providing one slot or coil per phase for each and every pole in the field frame.

**Uni-Directioned Currents.**—(1) Currents that have been caused to take the same direction by means of a commutator. (2) Commuted currents.

**Uni-Directioned Electromotive Forces.** Unidirectional electromotive forces.

**Unidirectional.**—Possessing the same direction.

**Unidirectional Discharge.**—An electric discharge which preserves the same direction from the beginning to the end of the discharge.

**Unidirectional Electromotive Forces.** Similarly directed electromotive forces.

**Unidirectional Leak.**—A gradual loss or leakage of electricity which takes place in the same direction.

**Unifilar Suspension.**—Suspension by means of a single wire or thread.

**Uniform Density of Field.**—A field in which the density is the same in all equal areas of similar cross-section.

**Uniform Flux.**—Uniform magnetic flux.

**Uniform Magnetic Field.**—(1) A field of uniform density. (2) A field traversed by the same number of lines of magnetic flux in all portions of area of normal cross-section. (3) Magnetic flux in straight lines and of uniform density.

**Uniform Magnetic Filament.**—A term sometimes applied to a magnetic filament.

**Uniform Magnetic Flux.**—(1) A magnetic flux whose density is everywhere the same. (2) The flux of a uniform magnetic field.

**Uniform Magnetization.**—Such a magnetization of a rectangular or cylindrical bar that equal areas of normal cross-section are traversed by the same quantity of magnetic flux.

**Uniform Potential.**—(1) A potential whose value does not vary from point to point. (2) A constant potential.

**Uniformly Distributed Current.**—(1) A term sometimes employed in the sense of a steady current. (2) A current having the same density at all points in a cross-section of a conductor.

**Unigraph.**—A portable form of sending and receiving Morse instrument in one piece.

**Uninsulated Return.**—(1) A return which employs the earth only as a return circuit. (2) An earth-return.

**Uni-Periodic Current.**—An alternating current of a single frequency, as distinguished from a multi-periodic current.

**Uniphase.**—Single phase.

**Uniphase Alternator.**—An alternator that produces uniphase currents.

**Uniphase Armature.**—The armature of a uniphase alternator.

**Uniphase Armature-Winding.**—Such an armature winding as will produce uniphase alternating currents.

**Uniphase Circuit.**—Any circuit through which uniphase or single-phase currents are passing.

**Uniphase Dynamo.**—A uniphase alternator.

**Uniphase Generator.**—A uniphase alternator.

**Uniphase Motor.**—An electric motor capable of being operated by uniphase currents.

**Uniphase.**—A term sometimes employed for a uniphase alternator.

**Uniplanar.**—Confined to a single plane.

**Unipolar.**—Possessing a single pole.

**Unipolar Alternator.**—An alternator provided with a so-called single magnetic pole.

**Unipolar Armature.**—A dynamo-electric machine armature whose polarity is not reversed during its rotation in the field of the machine.

**Unipolar Dynamo.**—(1) A dynamo provided with a unipolar armature. (2) A commutatorless, continuous-current dynamo.

**Unipolar Electric Bath.**—An electrotherapeutic bath in which the water forms one of the electrodes of the source.

and the other electrode is attached to a metal rod fixed at a convenient height above the body.

**Unipolar Induction.**—(1) A term sometimes applied to the induction that occurs when a conductor is so moved through a magnetic field as to continuously cut its lines of force. (2) The induction that occurs in a commutatorless, continuous-current dynamo.

**Unipolar Magnet.**—A term proposed for a magnet in the shape of a long bar, one pole of which lies in the axis of rotation, the axis being placed near to the other pole which is balanced by a counterpoise.

**Unipolar Stimulation of Nerve.**—The stimulation of a nerve produced by the application of a single electrode to that nerve.

**Uni-Slot Armature-Winding or Alternator.**—An alternator armature-winding in which a single slot is provided for each and every pole in the armature frame.

**Unit Angle.**—(1) A radian. (2) An angle equal to  $57.29578^\circ$ ; or,  $57^\circ 17' 44.8''$  nearly. (3) A degree, minute, second, grad, radian or other unit of angular measure.

**Unit Angular Velocity.**—(1) A radian per second. (2) The velocity under which a particle moving in a circular path whose radius is equal to unity, would traverse unit angle in unit time. (3) Any angular velocity which describes a unit angle in unit time.

**Unit Difference or Potential of Electromotive Force.**—(1) Such a difference of potential between two points that requires the expenditure of one erg of work to bring a unit of positive electricity from one of these points to the other, against the electric force. (2) In the practical system of units, the volt.

**Unit Jar.**—A small Leyden jar sometimes employed to measure, approximately, the quantity of electricity passing into a Leyden battery or condenser.

**Unit Magnetic-Pole.**—(1) A magnetic pole whose strength is such that it would act on a similar pole at a distance of one centimetre with a force of a dyne. (2) A magnetic pole of unit strength.

**Unit of Acceleration.**—That acceleration which will give to a body unit velocity in unit time, as for example, a centimetre-per-second per-second.

**Unit of Activity.**—(1) A rate-of-doing-work that will perform one unit of work in each second. (2) In the C. G. S. sys-

tem, an activity of one erg-per-second. (3) In the practical system, the watt.

**Unit of Diviance.**—A term proposed for unit of resistance to lines of electrostatic force.

**Unit of Electric Quantity.**—(1) A unit quantity of electricity. (2) The quantity of electricity conveyed by unit current per second. (3) In the practical system of units, the coulomb.

**Unit of Electric Supply.**—(1) A unit, provisionally adopted in England by the Board of Trade, equal to a supply of one thousand amperes flowing for one hour under an electromotive force of one volt. (2) The Board of Trade unit, or kilowatt-hour. (3) An amount of electric energy equal to 3,600,000 joules.

**Unit of Electric Work.**—The joule.

**Unit of Electrostatic Capacity.**—(1) Such a capacity of a condenser, or conductor, that an electromotive force of one volt will charge it with a quantity of electricity equal to one coulomb. (2) The farad.

**Unit of Force.**—(1) A force which acting for one second on a mass of one gramme will give it a velocity of a centimetre-per-second. (2) In the C. G. S. system, the dyne.

**Unit of Heat.**—(1) The quantity of heat required to raise a given weight of water through one degree of the thermometric scale. (2) The British thermal unit or the pound-degree-Fahrenheit; i. e., the amount of heat required to raise one pound of water one degree Fahrenheit. (3) The greater calorie, or the amount of heat required to raise the temperature of one thousand grammes of water one degree centigrade. (4) The smaller calorie, or the amount of heat required to raise the temperature of one gramme of water one degree centigrade. (5) The joule; or the quantity of heat energy developed in a second by the passage of a current of one ampere through the resistance of one ohm.

**Unit of Illumination.**—The lux.

**Unit of Inductance.**—(1) A unit of length equal to one centimetre. (2) In the practical system of units, a seecohm or quadrant. (3) The henry.

**Unit of Light.**—Such a light that collected at a single point, would produce unit illumination at unit distance from such point.

**Unit of Luminous Intensity.**—The British candle; or the intensity of light emitted by a candle, of definite dimen-

sions and composition, burning at the rate of two grains per minute.

**Unit of Magnetic Flux.**—The weber; or, the amount of flux which would pass through a magnetic circuit whose reluctance is one oersted, under a magneto-motive force of one gilbert.

**Unit of Magnetic Intensity.**—The gauss; or, a flux density of one weber-per-square-centimetre of normal cross-section.

**Unit of Magnetic Reluctance.**—The oersted; or, the reluctance which is offered to the passage of magnetic flux by a cubic centimetre of air, when measured between parallel faces.

**Unit of Magneto-Motive Force.**—The gilbert; or, the magneto-motive force which is required to act on a circuit in order to cause one weber of flux to pass through it against a reluctance, or magnetic resistance of one oersted.

**Unit of Mass.**—The quantity of matter in a standard gramme.

**Unit of Out-Put of Dynamo-Electric Machine.**—(1) The unit of electric power furnished by the current of a dynamo-electric machine. (2) The kilowatt.

**Unit of Photometric Intensity.**—The intensity of light produced by a candle of given dimensions and composition that consumes two grains per minute.

**Unit of Resistance.**—(1) Such a resistance that unit difference of potential is required to cause the passage of unit current strength through it. (2) In the practical system of units, the ohm.

**Unit of Self-Induction.**—The unit of inductance.

**Unit Quantity of Electricity.**—(1) Such a quantity of electricity as would pass in one second through a circuit whose resistance is one ohm under an electromotive force of one volt. (2) The coulomb.

**Unit Strength of Current.**—(1) Such a strength of current that when passed through a circuit one centimetre in length arranged in an arc of a circle one centimetre in radius, will exert a force of one dyne on a unit magnetic pole placed at the centre. (2) In the practical system of units, the ampere. (3) In the C. G. S. system of units, ten amperes.

**Unit of Power.**—Any unit which measures the rate at which energy is expended, such as the erg-per-second, the foot-pound-per-minute, the kilogramme-metre-per-minute, the horse-power, etc.

**Unit of Twist of a Fibre.**—Such a twist that in unit of length of fibre a unit angular twist is produced.

**Units of Work.**—(1) The erg. (2) A dyne-centimetre, or the amount of work done when a force of one dyne acts through a distance of one centimetre. (3) A foot-pound, or the amount of work required to raise one pound vertically through the distance of one foot.

**Univalent.**—(1) Possessing a valency or atomicity of one. (2) Monovalent.

**Universal Battery System.**—In telegraphy or telephony, a system of employing one battery for the supply of a plurality of circuits.

**Universal Discharger.**—An apparatus for sending the discharge of a Leyden jar, or condenser, through any desired circuit.

**Universal Ether.**—(1) The luminiferous ether. (2) The ether.

**Universal Switch.**—A pin switchboard composed of horizontal and vertical metallic bars capable of inter-connection by means of pins.

**Unlighted Segment of Aurora.**—A term frequently applied to the dark segment of an aurora.

**Unmarked End of Magnet.**—A name formerly applied to the south-seeking pole of a magnet.

**Unmarked Pole of Magnet.**—The south-seeking pole of a magnet.

**Unmarked Magnet Pole.**—A name sometimes given to the south pole of a magnet.

**Unplugging.**—Introducing the resistance of a resistance box into a circuit by the removal of the plug keys.

**Unpolarized.**—Devoid of polarization.

**Unsilvering Bath.**—A stripping bath, suitable for the removal of a coating of silver.

**Unsymmetrical Polyphase Motor.**—A polyphase motor provided with unsymmetrical windings.

**Untreated Filament.**—The filament of an incandescent lamp that has not been subjected to the flashing process.

**Unvarying Current.**—(1) A current whose strength does not vary from time to time. (2) A current of constant strength and direction.

**Up-and-Down-Working.**—In telegraphy, a method of operating consisting of sending a message over the line from each end alternately, as distinguished from batch working.

**Up-Contact of Switch.**—A contact which is made by the upward movement of a switch.



**Up Lines.**—In Great Britain, lines in the direction of the principal station on a circuit, as distinguished from the down lines.

**Up Side.**—In telegraphy in Great Britain, that side nearer to the principal station of a circuit, as distinguished from the down side.

**Upper Harmonics of Current.**—The higher frequencies of a simple-periodic or alternating current.

**Upright Board.**—A telephone switch-board whose surface is vertical, as distinguished from a flat board.

**Upright Galvanometer.**—A galvanometer whose needle moves in a vertical plane.

**Uranium Rays.**—A phrase sometimes employed for Becquerel rays.

**Urban Telephony.**—Telephonic communication between different portions of the same city.

**Urothral Electrode.**—An electro-therapeutic electrode suitable for treatment of the urethra.

**Useful Current.**—A name proposed for the effective current in an alternating-current circuit.

**Useful Life of Incandescent Lamp.**—The time during which an incandescent lamp can furnish practical and operative illumination.

**Utilizing Apparatus.**—Any device by means of which energy may be utilized.

## V

**V.**—A contraction for volt.

**V.**—A contraction for volume.

**V.**—A contraction sometimes used for velocity.

**v.**—(1) A symbol employed for the ratio existing between the units of resistance in the electrostatic and magnetic C. G. S. system of units. (2) A velocity ratio.

**V. A.**—A contraction sometimes used for voltaic alternatives.

**Vacuum.**—A space from which all, or nearly all, traces of gas have been removed.

**Vacuum Lightning-Discharger.**—A vacuum lightning protector.

**Vacuum Lightning-Protector.**—A lightning protector employing a vacuum tube for carrying off high-pressure discharges.

**Vacuum Manometer.**—Any manometer whose operation is independent of atmospheric pressure.

**Vacuum Pump.**—An air pump.

**Vacuum-Tube Lighting.**—Artificial illumination obtained by the passage of electric discharges through vacuum tubes.

**Vacuum Tubes.**—(1) Glass tubes in which the air or other gas has been partially removed, and through which electric discharges are passed for the production of luminous effects. (2) A name sometimes applied to Crookes, Roentgen, or other high-vacuum tubes.

**Vaginal Electrode.**—An electro-thera-

pentical electrode suitably shaped for the treatment of the vagina.

**Valency.**—The combining value of a chemical atom, as regards its power of displacing other atoms in chemical compounds.

**Valve, Electric.**—An electrically-controlled or operated valve.

**Vapor.**—A gaseous substance produced by the action of heat, or by reduction of pressure, on a vaporizable liquid.

**Vapor Globe of Incandescent Lamp.**  
A glass globe surrounding the chamber of an incandescent lamp, for the purpose of enabling it to be safely employed in an explosive atmosphere, or to permit it to be exposed in places where water is liable to fall on it.

**Vapor Pressure.**—The pressure at which a liquid changes into a vapor.

**Vaporization.**—The conversion of a volatile liquid into a vapor, either as in evaporation at the surface of a liquid, or throughout its mass, as in ebullition.

**Variable Condenser.**—A term sometimes employed for an adjustable condenser.

**Variable Inductance.**—(1) The inductance of a substance whose magnetic permeability is not constant. (2) An adjustable inductance.

**Variable Period of Electric Circuit.**—That period during which the current strength is rising or falling in a circuit, after the making or breaking of the same, until the current strength is reached or



until the line has been completely discharged.

**Variable Period of Electric Current.**

The time which is required for an electric current to reach its full strength after the circuit is made, or for reaching zero strength when its circuit has been opened.

**Variable Period of Telegraph Line.**

The time required for the current in a telegraphic line to reach a constant strength after the circuit through it has been closed.

**Variable Ratio Transformer.**—An alternating current transformer whose ratio of transformation is subject to variation.

**Variable Resistance.**—(1) A resistance, the value of which can be readily varied or changed. (2) An adjustable resistance.

**Variable State of Charge on Telegraph Line.**

The condition of the charge on a telegraph wire, while the strength of the current is increasing up to its full strength in all parts, or diminishing to zero.

**Variation Chart or Map.**—(1) A chart or map on which the variations of the earth's magnetism are marked. (2) An isogonic chart.

**Variation Magnetometer.**—A form of magnetometer suitable for measuring changes in the earth's magnetic variation at any place.

**Variation of Declination.**—A variation in the magnetic declination of the earth at any place.

**Variation of Earth's Magnetism.**—Any variation in the value of the magnetic declination or inclination that occurs simultaneously over all parts of the earth.

**Variation of Magnetic Needle.**—(1) The angular deviation of the magnetic needle from the true geographical north. (2) The declination of the magnetic needle.

**Variometer.**—(1) An instrument for comparing the horizontal component of the earth's magnetism in different localities. (2) The magnetic variometer.

**Varnish, Electric.**—A varnish formed of any good insulating material.

**Varley's Photometer.**—A form of photometer in which the intensity of the light to be measured is determined from the relative openings of two concentric circular diaphragms placed in two rotating discs through which the standard light and the light to be measured respectively pass.

**Varley's Unit of Resistance.**—The resistance of one statute mile of a special

copper wire  $\frac{1}{4}$ th of an inch in diameter. (No longer in use.)

**Varying Continuous Current.**—A direct current whose strength varies from time to time.

**Varying Unidirectional Current.**—A varying continuous or direct current.

**Vector.**—(1) A directed quantity. (2) A quantity possessing both direction and magnitude.

**Vector Diagram.**—A diagram representing the relations of vector quantities.

**Vector Equations.**—Equations connecting vector quantities.

**Vector Formula.**—A formula containing vector quantities.

**Vector Impedance.**—The impedance of an alternating-current circuit considered as a vector or directed quantity.

**Vector Potential.**—A potential possessing direction, as well as magnitude, derived by the process of summation of vectors or elementary directed quantities, as opposed to a scalar potential, or one possessing undirected magnitude.

**Vector Quantity.**—A quantity possessing both direction and magnitude.

**Vector Sum.**—The geometrical sum of two or more vector quantities.

**Vectorial Algebra.**—The algebra of vectors or directed quantities.

**Vehicle, Electric.**—(1) An electrically-propelled vehicle. (2) An automobile carriage.

**Velocimeter.**—Any apparatus for measuring the speed of a machine, or velocity generally.

**Velocity.**—The distance traversed by a body in any time.

**Velocity of Discharge.**—(1) The velocity with which a liquid or gas escapes from an orifice in a given time. (2) The time required for the passage of a discharge from a given length of conductor.

**Velocity of Transmission of Signaling.**—The apparent speed of transmission of signals over a telegraph circuit.

**Velocity Ratio.**—(1) A ratio of the nature of a velocity that exists between the dimensions of the electrostatic and electromagnetic units. (2) The ratio between the velocities of two mutually associated or interconnected bodies or parts in a machine.

**Vena-Contracts.**—A contracted vein or conical jet that exists in a jet of water escaping from a circular orifice in the wall of a containing vessel.

**Ventilated Armature-Windings.**—Armature windings provided with means for cooling by forcing currents of air over them.

**Ventilating Duct.**—A ventilating space.

**Ventilating Groove.**—A ventilating space or duct in an armature core.

**Ventilation of Armature of Dynamo or Motor.**—The renewal of air in the armature chamber, due to the passage through it of a stream of air employed for the purpose of preventing too high a temperature elevation during operation.

**Verdet's Constant.**—The magneto-optic constant of a transparent magnetized substance, expressed in angular rotation of the plane of polarization, for a luminous ray of definite frequency at a definite temperature, between points on the ray path whose magnetic potential differs by unity.

**Voroscope.**—A form of bioscope.

**Vernier.**—A device for the more accurate measurement of smaller differences of length or angle than could be detected by the eye alone, by means of the direct reading of the position of a mark on a sliding scale.

**Vernier Caliper.**—A caliper possessing a vernier scale provided for greater precision in observation.

**Vernier Slides.**—A pair of resistance slides one of which is connected in shunt to a pair of contacts on the other.

**Vernier Wire-Gauge.**—A micrometer wire-gauge.

**Vertical Component of Earth's Magnetism.**—That component of the earth's directive force which acts in a vertical direction.

**Vertical Electrostatic Voltmeter.**—A form of voltmeter the needle of which moves in a vertical instead of in a horizontal plane.

**Vertical Galvanometer.**—A galvanometer whose needle is capable of motion in a vertical plane only.

**Vertical Intensity of Earth's Magnetism.**—(1) The vertical component of the earth's magnetism. (2) The force which tends to cause a magnetic needle to assume a vertical position.

**Vertical Magnetic Needle.**—A magnetic needle free to move in a vertical plane only.

**V. Frog.**—A trolley frog shaped like a letter V.

**Vibrating.**—Periodically moving to-and-fro.

**Vibrating Bell.**—A name sometimes given to a trembling bell.

**Vibrating Contact.**—(1) A spring contact connected with one part of a circuit, and so supported as to be able to vibrate towards and from another part of the circuit, thus automatically closing and opening the same. (2) A form of automatic contact-breaker.

**Vibrating Electric Doublet.**—A source of electro-magnetic waves consisting of two equal and opposite oscillating charges concentrated on two small conductors whose distance from each other is indefinitely small in comparison with the distance at which the resulting wave disturbance is considered.

**Vibrating Electrotome.**—An automatic circuit-breaker producing a musical note.

**Vibration.**—A complete to-and-fro movement of a vibrating body.

**Vibration Frequency.**—The number of vibrations produced per second.

**Vibration Needle.**—A tube containing cylindrical weights for attachment to a suspension for measuring the torsional rigidity of the same.

**Vibration Period.**—The period of a single or whole vibration in a conductor in which an oscillatory vibration is being produced.

**Vibrator.**—An electro-magnetic device provided on a siphon recorder for maintaining the siphon in continual vibration, so that ink is thrown from it on a fillet of paper beneath.

**Villari Critical Point.**—A term proposed for that strength of magnetic field at which the reversal of the effects of tension occurs.

**Vine System of Space Relations.**—A system of space relations, usually adopted by electrical writers, which follows the vine tendril; i. e., which considers advance in the direction of a right-handed rotation as positive.

**Violle.**—A unit of luminous intensity produced in a perpendicular direction by one square centimetre of platinum at the temperature of its solidification.

**Violle Lamp.**—The violle.

**Virgin Iron.**—Iron that has never been subjected to magnetization.

**Virtual Amperes.**—(1) Amperes measured in an alternating current as the square root of the mean square of the current, and determined by an ammeter

calibrated by constant currents. (2) Effective amperes.

**Virtual Conductance.**—A term sometimes employed for equivalent conductance.

**Virtual Counter Electromotive Force.**—Effective C. E. M. F. in an alternating-current circuit.

**Virtual Current.**—The virtual amperes.

**Virtual Resistance.**—The apparent resistance of a circuit.

**Virtual Voltage.**—Voltage measured in an alternating current circuit as the square root of the mean square of the value in volts, as obtained by a voltmeter calibrated by continuous currents.

**Virtual Work.**—In a system of bodies or material points, the amount of work which would be done by the force acting upon the bodies in an indefinitely small displacement, and which work vanishes when the system is in equilibrium.

**Viscous Hysteresis.**—(1) The time lag observed in magnetizing a bar of iron which is neither referable to the induction in the iron nor to self-induction in the magnetizing current, but to the magnetic viscosity of a substance. (2) A sluggishness exhibited by iron for magnetization or demagnetization, due to magnetic viscosity.

**Visual.**—Of or pertaining to vision.

**Visual Angle.**—An angle subtended between two lines drawn from an eye to opposite extremities of an object.

**Visual Clearing-Indicator.**—(1) An indicator at a telephone exchange for informing the operator that a conversation has ended, by the lighting up of a little incandescent lamp through a relay contact. (2) A clearing indicator appealing to the eye, as distinguished from an indicator which releases a drop.

**Visual Telegraphic Signals.**—Telegraphic signals that can be seen, as distinguished from those which can be heard.

**Visual Telegraphy.**—(1) Any system of telegraphy whose receiving instruments give visual signals. (2) Needle telegraphy.

**Vis-Viva.**—(1) The energy stored in a moving body. (2) The measure of the amount of work that must be performed in order to bring a moving body to rest.

**Vitreous.**—Of or pertaining to glass.

**Vitreous Electricity.**—A term formerly employed for positive electricity.

**Vitreous Electrification.**—A term formerly employed for positive electrification.

**Vitrite.**—A variety of insulating substance.

**Volatilization, Electric.**—(1) A term sometimes used instead of electric evaporation. (2) The volatilization of a conductor under the influence of heat of electric origin.

**Volatilization of Electric Conductor.**—The deflagration of an electric conductor by electrically generated heat.

**Volcanic Lightning.**—The lightning discharges that attend most volcanic eruptions.

**Volt.**—(1) The practical unit of electromotive force. (2) Such an electromotive force as is induced in a conductor which cuts lines of magnetic flux at the rate of 100,000,000 per second. (3) Such an electromotive force as would cause a current of one ampere to flow against a resistance of one ohm. (4) Such an electromotive force as would charge a condenser of the capacity of one farad with a quantity of electricity equal to one coulomb. (5) 10<sup>8</sup> absolute electro-magnetic units of electromotive force.

**Volt-Ammeter.**—(1) A name sometimes given to any instrument capable of measuring either the volts or the amperes in a circuit, or both. (2) The measurer of the volt-amperes or watts. (3) A wattmeter.

**Volt-Ampere.**—The watt.

**Volt Box.**—The name sometimes given to a divided wire placed across the terminals of a voltmeter to be tested. (2) A name sometimes given to a resistance divided into such sections that any suitable fractional drop in potential in the entire resistance can be readily measured by a potentiometer.

**Volt Indicator.**—A name sometimes given to a voltmeter.

**Voltage.**—The value of the electromotive force or difference of potential of any part of a circuit, expressed in volts.

**Volta-Electric.**—Of or pertaining to volta-electricity.

**Volta-Electric Induction.**—A term sometimes used for voltaic induction.

**Volta-Electricity.**—A word sometimes used for voltaic electricity.

**Volta-Electrometer.**—A word sometimes used for voltmeter.

**Volta-Electrometric.**—Of or pertaining to a voltmeter or to voltaic electricity.

**Volta-Electromotive Force.**—Voltaic electromotive force.

**Volta-Force.**—Contact force between different metals.

**Volta-Plast.**—An unnecessary word proposed for a voltaic battery, used in electroplating.

**Volta-Type.**—An unnecessary word proposed for electro-type.

**Volta's Law.**—The difference of potential between any two metals is equal to the sum of the difference of potential between the intervening substances in the contact series.

**Voltagraphy.**—An unnecessary word sometimes used for electro-typing.

**Voltaic Accumulator.**—A term sometimes used for a secondary cell.

**Voltaic Alternatives.**—(1) A term used in medical electricity for the sudden reversals in the polarity of the electrodes of a voltaic battery employed in electrotherapeutics. (2) An alternating current obtained from a voltaic battery by the use of a suitable commutator.

**Voltaic Arc.**—(1) A brilliant arc or bow of light which appears between the electrodes or terminals of a sufficiently powerful source of electricity, when placed in contact and then separated a short distance from each other. (2) The source of light of the electric arc-lamp.

**Voltaic Balance.**—An apparatus employed to measure the voltaic energy present in any aqueous solution by balancing the electromotive forces produced by two small zinc-platinum couples immersed in water and placed in series with the circuit of a sensitive galvanometer, so as to balance one another, and then applying a solution of the substance whose energy is to be measured to the liquid in one of the solutions.

**Voltaic Battery.**—The combination as a single source of a number of separate voltaic cells.

**Voltaic Battery Indicator.**—A device for indicating the condition of a voltaic battery.

**Voltaic Battery Protector.**—A device for automatically opening the circuit of a voltaic battery, whenever it becomes accidentally grounded.

**Voltaic Bow.**—A word sometimes used for a voltaic arc.

**Voltaic Capacity of Accumulator.**—A term sometimes applied to the storage capacity of an accumulator.

**Voltaic Cell.**—(1) The combination of two metals, or of a metal and a metalloid, which, when dipped into a liquid or liquids called electrolytes, and connected by a conductor, will produce a current of elec-

tricity. (2) A voltaic couple and its accompanying electrolytes.

**Voltaic Circle.**—A name formerly employed for voltaic cell or circuit.

**Voltaic Circuit.**—The path through which the current flows from a voltaic cell or battery through the translating devices and back again through the cell or battery.

**Voltaic Couple.**—Any two materials, generally dissimilar metals, which are capable of acting as an electric source when dipped into an electrolyte.

**Voltaic Coupler.**—Any device by means of which voltaic cells may be readily coupled or connected in different varieties of circuits.

**Voltaic Effect.**—The difference of potential observed at the point of contact of dissimilar metals.

**Voltaic Electricity.**—The difference of potential produced by a voltaic cell or battery.

**Voltaic Electromotive Force.**—A term sometimes used for the electromotive force generated at the electrodes of an electrolytic cell in contradistinction to the counter-electromotive force produced at such electrodes before polarization.

**Voltaic Elements.**—Two metals or substances which form a voltaic couple.

**Voltaic Endosmosis.**—A term sometimes used for electric osmosis or endosmosis.

**Voltaic Force.**—A word sometimes used for voltaic electromotive force.

**Voltaic Heat Cell.**—A cell by means of which heat energy is changed or converted into electric energy.

**Voltaic Impulse.**—A word sometimes used for the electromotive impulse of a voltaic couple.

**Voltaic Induction.**—A word sometimes used for current induction.

**Voltaic Magnet.**—An unnecessary term sometimes employed for a solenoid or electro-magnetic helix.

**Voltaic Pair.**—A voltaic couple.

**Voltaic Pile.**—A word sometimes used for voltaic battery.

**Voltaism.**—(1) A word sometimes employed in electro-therapeutics for treatment by means of the voltaic current. (2) The production of electricity by means of voltaic couples.

**Voltameter.**—An electrolytic cell employed for measuring the quantity of electric current passing through it, by the amount of chemical decomposition affected in a given time.



**Voltameter Law.**—The amount of chemical action produced by electrolysis in any electrolyte is proportional to the quantity of electricity which passes through that electrolyte.

**Volta's Condensing Electroscope.**—An electroscope whose leaves are charged by means of a condenser, employed for the detection of feeble charges.

**Voltmeter.**—Any instrument employed for measuring differences of potential.

**Voltmeter Panel of Switchboard.**—The panel of a switchboard containing a voltmeter or voltmeters.

**Voltmeter Switch.**—A switch for readily and safely connecting a voltmeter with any one of a number of circuits whose pressures may have to be measured.

**Volume Density, Electric.**—The amount of electricity per unit of volume.

**Volume Density of Charge.**—The electric volume density.

**Volume of Illumination.**—A term proposed for a total quantity of illumination comprised between a surface on a horizontal plane, and the locus of the extremities of ordinates drawn vertically to each part of that surface, in values representing the intensity of illumination at that point.

**Volume Specific Resistance.**—(1) The electric resistance of a cubic centimetre of material measured between opposite faces of the cube, and expressed in the C. G. S. absolute system of units. (2) Volume-resistivity. (3) Specific resistance by volume as compared with the volume resistance of a standard substance.

**Volume Voltameter.**—A voltmeter in

which the quantity of current passing is determined by the volume of gas evolved.

**Volumetric Energy.**—(1) Energy per unit of volume. (2) The energy in any substance or space divided by the volume of the substance or space.

**Vortex Atom.**—A hypothetical vortex in the ether constituting an atom of a material substance.

**Vortex Cylinder.**—A cylindrically shaped vortex ring.

**Vortex Ether.**—An ether possessing inertia and capable of forming vortices like a frictionless liquid.

**Vortex Ring.**—(1) A ring of vortically moving matter. (2) A name sometimes given to a motion in the air or other gross matter, similar to that which is supposed to constitute a vortex atom.

**Vortex-Ring Field.**—The field of influence possessed by a vortex ring.

**Vortex Stream Lines.**—Stream lines in the ether or matter, constituting a vortex atom or ring.

**Vulca.**—A variety of insulating material.

**Vulcabeston.**—A variety of insulating substance composed of asbestos and rubber.

**Vulcanite.**—(1) A variety of vulcanized rubber, possessing high powers of insulation and specific inductive capacity. (2) Ebonite.

**Vulcanized Fibre.**—A variety of insulating material suitable for purposes requiring the highest insulation.

**Vulcanizing Wooden Poles.**—Subjecting poles to the action of heat while in a closed cylinder.

## W

**W.**—A contraction for watt.

**W.**—A contraction for work.

**W.**—A contraction for weight.

**W.**—A contraction for physical energy, whether electrical, thermal, mechanical or chemical; or, in general, for the product of the force acting, and the distance through which it acts.

**W.**—A symbol for electric energy.

**W.**—A symbol proposed for moment of a couple.

**W. H. E.**—A contraction for watt-hour efficiency.

**W. P.**—A contraction for waterproof.

**w. h.**—An abbreviation for watt-hour, a practical unit of electric energy.

**Wall Box for Flush Switch.**—A box sunk in a wall for the reception of a flush switch.

**Wall Bracket.**—(1) An insulator bracket attached to a wall. (2) A more or less ornamental support for one or more incandescent lamps attached to the wall of a room, hall, or corridor.

**Wall Frame for Flush Switch.**—A term sometimes used for the wall box of a flush switch.

**Wall Plug.**—A plug provided for the insertion of a lamp or other electro-recep-

tive device in a wall socket, thus connecting it with the lead.

**Wall Set.**—Telephone apparatus arranged for use when supported on or against a wall.

**Wall Socket.**—A socket placed in a wall and provided with openings for the insertion of a wall plug with which the ends of a flexible twin-lead are connected.

**Wand, Electric.**—A term sometimes used for an electrophorus in the form of a torch.

**Wandering of Electric Spark.**—A discharge possessing the appearance of a brilliant luminous globule, which moves slowly, in an irregular path, over the surface of the tin-foil on a condenser to which the terminals of a powerful rheo-static machine is placed, when a portion of the mica plate in the condenser is accidentally pierced.

**Wanted Station.**—A word sometimes employed for a station that is desired by a telephone subscriber.

**Ward.**—A term proposed for a line and direction in a line.

**Waring Anti-Induction Cable.**—A form of lead-covered anti-induction cable.

**Washer Plate.**—A buried metallic plate for supporting the tension of a stay-rod.

**Waste Magnetic Field.**—A term frequently employed for stray field.

**Watch-Case Telephone Receiver.**—A name sometimes given to a small telephone receiver in the shape of a watch-case.

**Watchman's Electric Clock.**—A name sometimes given to a watchman's electric register.

**Watchman's Electric Register.**—A clock device for permanently recording the time of a watchman's visit to each of the different localities he is required to visit at stated intervals.

**Water Battery.**—A battery formed of zinc-copper couples immersed in an electrolyte of ordinary water.

**Water-Cooled Transformer.**—A transformer that is cooled by the forced circulation of water through it.

**Water-Dropping Accumulator.**—A device for increasing the difference of potential between two electric charges, by the dropping of water through electrified funnels.

**Water-Dropping Collector.**—A term sometimes employed for a water-dropping accumulator.

**Water-Gramme-Degree Centigrade.**—

(1) A heat unit equal to the quantity of

heat required to raise a gramme of water one Degree Centigrade. (2) The small calorie.

**Water Horse-Power.**—A term employed by the Indian Government for a horse-power developed by falling water, and estimated as being equal to 15 cubic feet of water falling per second, through a distance of one foot.

**Water Telephone Transmitter.**—A telephone transmitter consisting of a jet of water issuing vertically downwards from a small orifice.

**Water-Level Alarm, Electric.**—(1) A device for electrically sounding an alarm when a water level varies materially from a given level. (2) A liquid-level alarm.

**Water-Pipe Resistance.**—The resistance which any pipe offers to the flow of water through it.

**Water-Proof Wire.**—Wire covered by a water-proof material.

**Water Pyrometer.**—A pyrometer employed for determining the temperature of a furnace, or other intense source of heat, by the increase in temperature of a known weight of water, into which a metal cylinder of a given weight has been put, after having been exposed for a given time to the source of heat to be measured.

**Water Rheostat.**—A rheostat whose resistance is obtained by means of a mass of water of fixed dimensions.

**Water-Tube Dead-Beat Suspension.**—A dead-beat suspension obtained for the mirror of a sensitive galvanometer by the resistance offered by water in a tube to the movement of a vane attached to the suspension axis.

**Water Voltaic Cell.**—A cell consisting of a couple immersed in ordinary water.

**Water Voltameter.**—A name sometimes given to a dilute sulphuric acid voltameter.

**Watt.**—(1) A unit of electric power. (2) A volt-ampere. (3) The power developed when 44.25 foot pounds of work are done in a minute, or 0.7375 foot-pound of work is done in a second.

**Watt Arc.**—A voltaic arc, the electric power of which is estimated in watts.

**Watt Balance.**—A form of electric balance suitable for measuring in watts the electric energy developed in any circuit.

**Watt Generator.**—A term sometimes employed for the power in watts that any electric source is capable of producing.

**Watt-Hour.**—(1) A unit of electric work.

(2) A term employed to indicate the expenditure of an electric power of one watt for an hour.

**Watt-Hour Efficiency of Storage Battery.**—The ratio between the amount of electric work in watt-hours a battery will yield after being charged, and the amount of work in watt-hours expended in charging it.

**Watt-Hour Meter.**—A form of recording watt-meter.

**Wattless Component.**—A component of E. M. F. or current, in quadrature with the working component.

**Wattless Component of Current.**—(1) In an alternating-current circuit that component of the current which is in quadrature with the impressed E. M. F. and which, therefore, takes from or gives no energy to the circuit. (2) In an alternating-current circuit the product of the E. M. F. and the effective susceptance.

**Wattless Component of Electromotive Force.**—(1) In an alternating-current circuit, that component of the E. M. F. which is in quadrature with the current strength, and, therefore, does no work on the current. (2) In an alternating-current circuit the product of the current and the effective reactance.

**Wattless Current.**—(1) That component of an alternating electric current which is in quadrature with the pressure and which, therefore, does no work. (2) The idle current. (3) In an alternating-current circuit the product of the effective susceptance and the E. M. F.

**Wattless E. M. F.**—(1) The wattless component of E. M. F. in an alternating-current circuit. (2) The reactive E. M. F., as distinguished from the active E. M. F. of an alternating-current circuit. (3) In an alternating-current circuit, the product of the E. M. F. and the effective or apparent conductance.

**Wattless Magnetizing Current.**—(1) A component of the magnetizing current which consumes no power on the average. (2) That component of the current which flows through the primary of a transformer, which serves for magnetizing only, and which is in quadrature with the pressure, as distinguished from the component of magnetizing current which expends energy in the iron core.

**Wattmeter.**—An instrument for measuring the power in any circuit.

**Watt-Minute.**—(1) A unit of electric work. (2) An expenditure of electric power of one watt for one minute.

**Watt-Second.**—(1) A unit of electric work. (2) An expenditure of electric power of one watt for one second. (3) A joule.

**Wave.**—An oscillatory motion in an elastic medium, periodic in time.

**Wave Bisector.**—An electric chronograph for determining the current or potential in a telegraph circuit or line at any given small interval of time after the application of the sending current.

**Wave, Electric.**—An electric periodic disturbance in an elastic medium.

**Wave Form of Alternating Current.**—Any particular type of an alternating-current wave.

**Wave Form of Alternating Current.**—A graphical type of an alternating-current wave.

**Wave Winding.**—(1) Undulatory winding. (2) Continuous winding. (3) A winding which, when developed, has the form of a wave.

**Waves of Condensation and Rarefaction.**—(1) The alternate spheres of condensed and rarified air by means of which sound is propagated. (2) Sound waves.

**Way.**—A term sometimes employed for cable way.

**Way Lease.**—A permit obtained from the owner of a property for the erection of poles or other attachments for telephonic or telegraphic lines.

**Way Leave.**—A word sometimes used for way lease.

**Way Leave.**—(1) A right of way. (2) An easement.

**Way Line.**—A line communicating with way stations.

**Way Office Cut-Out.**—A cut-out employed for inserting or removing a way office in a telegraphic line, by the aid of a plug.

**Way Telegraphic Station.**—Any station intermediate between the terminal stations.

**Ways for Dynamo-Electric Machine.**—Slides on the base of a dynamo-electric machine for moving part of its frame.

**Weather Contact.**—(1) A weather cross. (2) A partial contact between wires owing to leakage in bad weather.

**Weather Cross.**—A contact or leak occurring in a telegraphic or other line during wet weather, from a defective action of the insulators.

**Weather Proof Insulation.**—A trade-name for a character of insulation consisting of one or more layers of braided



material soaked in an insulating compound.

**Weather-Proof Wire.**—A wire provided with weather-proof insulation.

**Weber.**—(1) The practical unit of magnetic flux. (2) A unit of magnetic flux having the value of one absolute unit or line. (3) A term formerly employed for unit of current, but now replaced by ampere. (4) A term proposed by Clausius and Siemens, but not adopted, for a magnetic pole of unit strength.

**Weber Turns.**—Flux linkages in C. G. S. units of flux and the turns through which they pass.

**Weber's Theory of Diamagnetism.**—A theory which endeavors to account for the phenomena of diamagnetism on the assumption of originally magnetized particles, molecules, or atoms.

**Wedge Battery.**—In a telegraph station, a battery whose terminals are connected with a wedge for insertion in a jack.

**Wedge Cut-Out.**—A form of cut-out employed on telegraphic circuits.

**Weeding-Out of Harmonics by Electric Resonance.**—Gradually removing the upper harmonics from a complex-harmonic current by altering the natural period of the system, until it is in unison or resonance with the fundamental frequency.

**Weight of Observations.**—The relative numerical reliability of observations.

**Weight Efficiency of Transformer.**—The specific output or activity of a transformer.

**Weight Voltmeter.**—A voltmeter in which the quantity of current passing is determined by the difference of weight of the instrument after the current has passed for a given time.

**Weight Voltmeter.**—A voltmeter in which the potential difference to be measured is determined by the movement of a magnetic needle under the influence of the current, against the action of a weight.

**Wight-Per-Mile-Ohm.**—(1) A standard of conductivity of wires. (2) The weight per mile of a wire, multiplied by its resistance per mile at a given temperature.

**Welded Rail Bond.**—A rail bond effected by electrically welding together the ends of the rails.

**Welder.**—A name sometimes applied to an electric welder.

**Welding.**—Uniting, generally at a high

temperature, two pieces of metal in one without the appearance of a junction.

**Welding Converter.**—A welding transformer.

**Welding, Electric.**—Effecting the welding union of metals by means of heat of electric origin.

**Welding Transformer.**—A step-down transformer employed in electric welding.

**Welsbach Burner.**—A form of incandescent mantel burner whose light is due to the incandescence under the action of a Bunsen flame of a mantel covered with refractory materials.

**Western Union Splice.**—A term sometimes employed for an American wire joint.

**Wheatstone's Electric Balance.**—A name sometimes given to an electric bridge or balance.

**Wheatstone's Electric Bridge.**—A Wheatstone's electric balance.

**Wheel Brush.**—A name given to any rotary brush.

**Wheel Printing Telegraph.**—A printing telegraph in which a printing wheel is employed.

**Whip.**—A vibrating contact-maker.

**Whirl, Electric.**—(1) A term employed to indicate the circular directions of the lines of magnetic force surrounding a conductor conveying an electric current. (2) A magnetic whirl.

**Whistle, Electric.**—An automatic electric whistle.

**Whistling Effect.**—(1) An effect produced with a carbon transmitter and telephone receiver in a line, such that if the transmitter be close to the receiver and then slightly jarred, a musical note will be emitted by the receiver which will react upon the transmitter and produce similar sounds in other receivers on the same circuit. (2) A means sometimes employed to call a subscriber's attention when his receiver has been accidentally left in the line circuit, instead of the bell.

**White.**—Containing all the frequencies of the sun's radiation.

**White Heat.**—A temperature of a heated body, at which it emits all visible frequencies from the red to the violet, and therefore glows with a white light.

**Wig-Wag Signalling.**—A term sometimes used for torch signalling.

**Wimshurst's Electrostatic Machine.**—A form of influence electric machine.



**Wind and Water Line of Telegraph Pole.**—The surface of a telegraph pole at the level of the ground, where it is exposed to the destructive action of air and water.

**Wind, Electric.**—The convection streams of air particles produced at the extremities of points attached to the surface of charged insulated conductors.

**Windage of Dynamo Armature.**—A term proposed for the air-gap between the armature and the polepieces of a dynamo. (Not in general use.)

**Winding Space.** The space provided on an armature or magnet core for its magnetizing coils.

**Windings.**—A general name applied to the coils placed on an armature of a dynamo or motor, or on the core of an electro-magnet.

**Wind-Mill Electric.**—A term sometimes used for an electric flyer.

**Wind-Mill Meter.**—An alternating-current meter whose operation is dependent on the motion of a wind-mill, by currents of air set up by the heat emitted from a conductor through which the current to be measured is passing.

**Window Contact.**—A variety of burglar-alarm contact, by means of which an alarm bell is rung by a slight pressure against a blind contact, on any attempt from without, after the breaking of the glass in the window.

**Window-Tube Insulator.**—A tube of vulcanite, or other insulating material, provided for the insulation of a wire entering a room through a window.

**Wings.**—The conducting plates, flaps, or extensions, of an electric resonator or oscillator.

**Wipe Spark.**—A spark obtained from a spark coil by the wiping contact of a spring.

**Wiped Joint.**—(1) A wiped solder or plumber's joint. (2) A joint in the lead sheathing of a cable formed by adding free surface metal, as in a plumber's joint in lead pipes.

**Wiping Contact.**—A contact obtained by a wiping movement of one conductor against another.

**Wippe.**—An orthography sometimes employed for whip.

**Wire.**—(1) To provide with a conducting circuit. (2) To send a telegram.

**Wire.**—(1) A conductor that forms part of a circuit. (2) A telegram.

**Wire Core.**—A form of laminated core ob-

tained by the use of a number of iron wires.

**Wire Drum.**—A drum for holding overhead wires in process of erection.

**Wire Dynamometer.**—A line dynamometer.

**Wire Finder.**—Any form of galvanometer used to locate or find the corresponding ends of different wires in a bunched cable.

**Wire-Grating Polarizer.**—A series of parallel wires set in a frame and employed for polarizing electro-magnetic waves.

**Wire Guard.**—A wire netting placed over an incandescent lamp chamber, acting as a guard or protection for it.

**Wire Holder.**—(1) A form of insulator suitable for holding or supporting a wire. (2) A reel or cross suitable for holding a roll of wire.

**Wire Joint.**—(1) Any joint connecting two pieces of line wire. (2) A telegraphic joint.

**Wire Rail-Bond.**—A bond between contiguous or opposite rails effected by means of a conducting wire.

**Wire Selector.**—A wire finder.

**Wire Shade-Guard.**—A wire guard provided for the shade of an incandescent lamp.

**Wire Shield for Incandescent Lamp.**—A wire lamp-guard.

**Wire Splice.**—A splice effected between two pieces of wire.

**Wire Terminals.**—Metal eyes for soldering to the ends of wires and for connections to switchboards.

**Wire-Wound Armature.**—An armature which is wound with wire, as distinguished from an armature wound with bars.

**Wired.**—Provided with a conducting wire or wires.

**Wireless Telegraphy.**—(1) A general term for any form of telegraphic communication which can be effected without wire circuits. (2) Induction telegraphy. (3) Conduction telegraphy through the medium of the earth.

**Wiring.**—(1) Placing or installing the wires required in any circuit. (2) Collectively, the wires or electric conductors employed in any circuit of electric distribution.

**Wood Mouldings, Electric.**—Mouldings of dried non-conducting wood provided with longitudinal grooves for the recep-

tion and support of electric wires or conductors.

**Wood's Button-Repeater.**—A form of manual telegraphic repeater.

**Work.**—The product of the force by the distance through which it acts.

**Work, Electric.**—(1) The joule. (2) A volt-coulomb, or the work done by the passage of one conduct through one volt.

**Work-Meter.**—A word sometimes used for energy meter.

**Working Current.**—(1) In an alternating-current circuit, a name sometimes given to an active current, or that component of the current which is in phase with the pressure. (2) Any current in a circuit, which does work. (3) A current operating a translating device.

**Working Current of Motor.**—The active current of an alternating-current motor.

**Working Efficiency of Telegraphic Circuit.**—The variation or margin between the joint resistance of the line conductor and the resistance of the insulators supporting such conductor.

**Working Galvanometer-Constant.**—A term sometimes employed for galvanometer constant.

**Working Position of Switch.**—The position of a switch when closed.

**Working Speed of Cable.**—A term employed for the number of signals that can be sent over a cable in a given time.

**Working Substance of Storage Battery.**—A name sometimes given to the active material of a storage battery.

**Woven-Wire Dynamo or Motor Brushes.**—Gauze brushes for dynamos or motors.

**Wrapped Wire.**—Wire covered with a wrapping of insulating material.

**Wrecking Wagon for Trolley Line.**—A word sometimes used for repair wagon.

**Writing Error.**—In telegraphy an error made in writing a message.

**Writing Telegraph.**—A general name for the apparatus used in writing telegraphy.

**Writing Telegraphy.**—A species of facsimile telegraphy, by means of which the motions of a transmitting pen so vary the resistance of two lines connected with the receiving instrument, as to cause a receiving pen or stylus to reproduce them.

## X

**X-Graph.**—A word sometimes employed for radiograph.

**X-Radiation.**—A term sometimes used for Roentgen radiation.

**X-Ray Field.**—The field of activity of X-rays.

**X-Ray Fluoroscopy.**—The study of fluorescent effects obtained by means of the X-rays.

**X-Ray Lamp.**—A lamp consisting essentially of a high-vacuum tube, the inner walls of which are covered with crystals of calcium tungstate or other fluorescent substance, which emits fluorescent light when exposed to X-rays.

**X-Ray Photograph.**—A term sometimes employed for radiograph.

**X-Ray Photography.**—Photography effected by means of the X-rays.

**X-Ray Picture.**—A term sometimes employed for radiograph.

**X-Ray Source.**—Any source capable of producing X-rays.

**X-Ray Transformer.**—A transformer employed for obtaining the high-potential discharges employed in Roentgen or X-ray tubes.

**X-Ray Transformer-Coil.**—A form of induction coil employed for the production of X-rays.

**X-Ray Tube.**—A name sometimes given to a Roentgen ray tube.

**X-Rays.**—(1) A name frequently given to X-radiation. (2) The invisible rays emitted by an electrically excited Crookes tube, and which are capable of penetrating many substances opaque to light, and of producing actinic or fluorescent effects. (3) The unknown rays emitted by an X-ray tube from some point, generally opposite the cathode, which receives cathode-ray bombardment.

## Y

**Y-Connection of Three-Phaser.**—(1) The connection, resembling the letter Y, of the three circuits of a triphaser to a common junction. (2) Star connection.

**Y-Connected Three-Phaser Armature.** (1) A triphase armature having three circuits connected to a common point. (2) A star-connected triphase armature.

**Y-Connector.**—A connector resembling the letter Y in shape for joining a conductor to two branch wires.

**Y-Current.**—The current between any wire of a triphase system and the neutral point.

**Y-Guy for Telegraph Pole.**—A Y-shaped guy attached to a telegraph pole for preventing it from bending near the top.

**Y-Potential of Triphase System.**—The effective difference of potential or voltmeter pressure between one terminal or

conductor of a triphase system and the neutral point.

**Y-Shaped Spark.**—A variety of three-branched spark obtained by the discharge of a Leyden jar through a peculiar form of induction coil.

**Yale-Lock-Switch Burglar-Alarm.**—An apparatus whereby the opening of a door by an authorized party provided with a regular key, will not sound an alarm, but any other opening will sound an alarm.

**Yacht-Tender, Electric.**—An electrically propelled tender provided for use in connection with a yacht.

**Yoke.**—That portion of the iron of an electro-magnet that joins the two cores.

**Yoke Horse-Shoe Electro-Magnet.**—A horse-shoe electro-magnet whose two straight limbs are formed of two straight rods or bars connected together at one pair of ends by a yoke.

## Z

**Z.**—A symbol sometimes employed in electrotherapeutics for muscular contraction.

**Z.**—A symbol for electro-chemical equivalent.

**Z-Insulator.**—A simple form of single-shed earthenware overhead line insulator.

**Zamboni's Dry Pile.**—A form of dry pile consisting of discs of paper, silvered on one side and tinned on the other, placed together alternately with slightly moistened bin-oxide of manganese.

**Zeeman Effect.**—The broadening of the lines in the spectrum of a heated substance when placed in the flux of a powerful magnetic field.

**Zero Method.**—(1) Any method employed in electrical measurement, in which the value of the electromotive force, the resistance, current, or other similar quantities, are determined by balancing against such quantities equal values of the same units, and ascertaining the equality, not by the deflection of a needle of a galvanometer or electrometer, but by the absence of such deflections. (2) A null method.

**Zero Potential.**—(1) An arbitrary potential-level from which electric levels are measured. (2) The earth's potential.

**Zigzag Electro-Magnet.**—A multipolar electro-magnet whose magnetizing coils are separately wound in grooves cut in the face of straight or curved bars.

**Zigzag Electromotive Force.**—An electromotive force, the curve of which would have the general form of a zigzag.

**Zigzag Lightning.**—(1) A common variety of lightning flash, in which the discharge assumes a forked or zigzag appearance. (2) Forked lightning.

**Zigzag Periodic Electromotive Force.**—A zigzag alternating electromotive force.

**Zigzag Type of Periodically Alternating Electromotive Force.**—An alternating electromotive force whose graphic representation is a zig-zag curve.

**Zinc Battery.**—A battery employed in sending zinc currents to line.

**Zinc-Carbon Voltaic Cell.**—A voltaic cell consisting of a zinc-carbon couple immersed in a suitable electrolyte.

**Zinc-Copper Voltaic Cell.**—A voltaic cell consisting of a zinc-copper couple immersed in a suitable electrolyte.

**Zinc-Lead Accumulator.**—A secondary cell employing plates of lead and zinc.

**Zinc Currents.**—A term sometimes used for negative currents.

**Zinc-Lead Voltaic Cell.**—A voltaic cell consisting of a zinc-lead couple immersed in a suitable electrolyte.

**Zinc Plating.**—Electro-plating with zinc.

**Zinc Sender.**—A device employed in telegraphic circuits in order to counteract the retardation produced by the charge given to the line, in which a momentary reverse current is sent into the line after each signal.

**Zincs.**—A general term applied to the zinc elements of voltaic cells.

**Zincode of Voltaic Cell.**—A name for-

merly given to the zinc terminal or electrode of a voltaic cell.

**Zootrope.**—An optical toy depending on the persistence of vision, in which a number of pictures of animals are so caused to pass before the eye as to produce the appearance of the motions of life.

**Zonal Harmonic.**—A zonal surface harmonic.

**Zonal Surface Harmonic.**—A spherical harmonic which is symmetrical about an axis.

**Zone Lamp.**—A lamp provided with a lens-shaped chamber so as to cause it to throw out its light in a single zone only.





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